SHAFTER FLATS REFUSE PROCESSING AND TRANSFER STATION SOIL EXPLORATION REPORT

HONOLULU, OAHU, HAWAII
TAX MAP KEY: 1-1-6: POR. 3

To:
R. M. TOWILL CORPORATION

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

DECEMBER 14, 1975

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

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December 14, 1975

MR. FRANK DOYLE
R. M. Towill Corporation
1600 Kapiolani Boulevard
Honolulu, Hawaii 96814

Dear Mr. Doyle:

Subject: Shafter Flats Refuse Processing
and Transfer Station
Soil Exploration Report
(for foundation design purposes)
Honolulu, Oahu, Hawaii
Tax Map Key: 1-1-6: Por. 3

Transmitted herewith is our soil exploration report for general foundation design considerations for the proposed Shafter Flats Refuse Processing and Transfer Station at Honolulu, Oahu, Hawaii.

This report includes a Boring Location Sketch, boring logs, laboratory test results, general foundation design guidelines and limitations.

Respectfully submitted,

WALTER LUM ASSOCIATES, INC.

By Edward K. Watanabe
Edward K. Watanabe

CM/EKW:sa

C O N T E N T S

LABORATORY TESTS

Laboratory tests included natural water content and density, Atterberg limit, grain-size analysis, unconfined compression, laboratory torvane, and triaxial compression.

SOIL CLASSIFICATION SYSTEM

Soil samples were visually observed and subjected to appropriate tests in the laboratory. Based on visual observations and laboratory tests, the soil descriptions given on the boring logs are generally made in accordance with the "Unified Soil Classification System."

GEOLOGIC AND SOIL DESCRIPTIONS BY OTHERS

From a review of the soil and geologic maps of the area, the site is described by others as follows:

Stearns, H. T. and U. S. Geologic Survey, "Geologic and Topographic Map of Island Of Oahu," 1938 (see Figure 1):

Rf - Artificial fill composed of marine deposits.

Pls - Consolidated calcareous marine sediments.

U. S. Soil Conservation Service, "Soil Survey of Islands of Kauai, Oahu, Maui, Molokai and Lanai, State of Hawaii," August 1972:

FL - Fill land, mixed, consists of areas filled with material dredged from the ocean or hauled from nearby areas, garbage, and general material from other sources.

SHAFTER FLATS REFUSE PROCESSING AND TRANSFER STATION SOIL EXPLORATION REPORT

HONOLULU, OAHU, HAWAII
TAX MAP KEY: 1-1-6: Por. 3

SCOPE OF EXPLORATION

The purpose of this exploration was to evaluate general soil conditions for foundation design considerations for the proposed Shafter Flats Refuse Processing and Transfer Station at Honolulu, Oahu, Hawaii.

This report includes field explorations, laboratory tests, general foundation design guidelines and limitations.

A soil reconnaissance report, "Shafter Flats Refuse Processing and Transfer Station," May 20, 1975, was prepared previously.

FIELD EXPLORATION

Nine exploratory borings (Boring Nos. 6 thru 14) were made at the site. The approximate locations of the borings are shown on the Boring Location Sketch. Borings were made with 4 and 6-in. diameter augers using carbide and finger-type bits. Soil samples were recovered with 2 and 3-in. thin-wall tubes and a 2-in. standard split spoon sampler driven by a 140-lb hammer falling 30 inches. Field vane shear tests were also made.

Also attached are logs of 5 borings (Boring Nos. 1 thru 5) made previously for the soil reconnaissance report dated May 20, 1975.

GENERAL SITE CONDITIONS

The proposed site is located along the eastern bank of Moanalua Stream, about 230 ft north of Kamehameha Highway. Kahauiki Stream borders the site on the north.

Access to the site is by dirt roads from Middle Street.

The southeastern portion of the site is covered with stockpiles of soil and rubble. The elevations of the stockpiles vary from about 20 ft along the edges to about 40 ft near the center. Occasional dumping of material was still in progress during our field explorations. Some rubbish was noted in the stockpiles.

The western and northern portions of the site adjacent to the streams are relatively flat with gradients of about 5 to 10% down toward the streams. The elevations vary from about 10 to 14 ft along the bottoms of the stockpiles to about 3 to 9 ft along the tops of the stream banks.

The northern portion of the site was covered with brush.

INTERPRETATION OF SOIL CONDITIONS

From the field exploration and laboratory test results, the soils encountered in the borings, below the stockpile or below elevation 10± ft, may be approximated as follows:

Western Portion (Boring Nos. 2, 4, 11 and 13)

A surface crust, about 7 to 18 ft, of loose to medium silty sand and clay (probably fill) over soft or loose clay, silt and sand to about 85 to 115 ft. Below this: medium to stiff clay to 100 to 170 ft, the depths drilled.

Eastern Portion (Boring Nos. 1, 3, 5 thru 10 & 12)

A surface crust, about 3 to 16 ft, of medium to dense silty sand with clay and gravel (probably fill) underlain by loose to dense clayey silty sand and coral to 40 to 100 ft, the depths drilled.

In Boring Nos. 6, 7, 8 and 12, a 2 to 4-ft layer of soft peat and clay was noted near the water level.

Water was noted in the borings at about elevation +2.5 to -2 ft during the field explorations.

For more detailed descriptions of soils encountered in the borings, refer to the boring logs.

Variations to the above soil and water conditions are to be expected between borings and in localized areas.

DISCUSSION AND RECOMMENDATIONS

In general, the plan is to fill and grade the site and construct a refuse processing and transfer plant.

The proposed building will be a metal structure about 120 ft by 280 ft in plan with a mezzanine floor, an unloading platform on the eastern side and a loading platform on the western side of the building. Shredding machines and compactors will be housed in the building. Concrete or masonry walls will be used around the shredders and compactors. Roadways will connect the platforms and the entry road.

The main building floor will be at about elevation 23 ft; the unloading platform will be at about elevation 31 ft and the loading platform, shredders and compactors will be at about elevation 8 ft.

Fills of up to about 20 ft and basement type walls up to about 20 ft are proposed.

The shredder machine and foundation load is about 800 kips and the compactor about 250 kips.

At present, much of the site is covered with miscellaneous stockpiled materials. The stockpile may consist of soil with inclusions of metal, rubble and rubbish. Old air photos of the area indicate that the stockpiling may have started about 1968.

Below the stockpiles, the proposed site appears to be partly over alluvial deposits washed down from the streams and partly over an old sand-coral formation which may be part of Mokumoa Island (see Figure 1, General Geologic Sketch).

A slide occurred along the eastern bank of Moanalua Stream near the southern boundary of the site several years ago when the stream bed was deepened.

From the field explorations and geological maps, it appears that the western portion of the site along Moanalua Stream may be underlain by soft or loose material to depths of about 100 ft or more. The eastern portion of the site appears to be underlain by more sandy and coral materials with some soft or loose pockets.

Most of the stockpiled material is located centrally and toward the southeasterly portion of the site, away from the streams that border the site at the westerly and northern boundaries.

To reduce the probable settlements that may occur under this project, if practicable, the building should be located away from the streams and toward the southeasterly portion of the site. This location would take advantage of the better soil conditions and the surcharging effect due to the stockpile already in place.

Fills should be kept away from the stream banks and kept as low as practicable.

Due to the erratic nature of the underlying deposits, varying heights of the existing stockpile, varying fill heights and building loads and construction scheduling, settlements may vary considerably from a few inches to more than a foot with accompanying differential settlements.

To reduce the anticipated settlements and differential settlements, the following foundation alternates may be considered:

1. Surcharge-Spread or Continuous Footings

   Much of the site has been surcharged by existing stockpiles. However, the west side of the proposed building will probably have had little or no surcharge history.

To reduce the settlements, the building site, particularly the west side, should be surcharged with a load that is greater than the anticipated building loads. The effectiveness of the surcharge will depend on the nature and depths of the soft and loose underlying materials, preload history, weight of the surcharge and the surcharging period.

Settlement gages should be installed to get an indication of the settlement rate. When the settlements reduce to tolerable rates, construction may be started.

If the site is surcharged and allowed to remain in place until the time-settlement curves flatten out and the settlements reduce to tolerable rates, spread or continuous footings may be used. However, even if the surcharge is left in place a sufficient length of time, estimated settlements in the order of 1 to 3 inches or more and differential settlements of about 1/2 of the total settlement may be expected.

2. Pile-Spread and Continuous Footings

If surcharging the entire site is not practicable and foundations are located over areas where the surcharge or stockpiles may have been less than the anticipated building loads, then pile foundations in these areas may be considered, particularly along the western side of the building where the shredders and compactors are located.

Pile foundations will usually reduce settlements. Differential settlements between pile supported and non-pile supported elements should also be anticipated. A transition zone should be designed between the pile foundations and the spread footing foundation to reduce the effects of differential settlements between the two types of foundations. If differential settlements between slab on ground and the pile supported structure are not tolerable, a structural slab should be considered.

Site Grading

The stockpiled materials should be removed prior to site grading. The stockpiled materials may be used for fills providing the rubbish, miscellaneous and clayey (CH) materials are removed.

At the present time, the site may be unevenly surcharged with random stockpiles at the site.

Ideally, the site should be surcharged with a well-distributed load that is greater than the anticipated building loads. The site should be surcharged to an elevation of about 30 ft or more.

Surcharging the site may be accomplished in two ways:

One may be to spread the present stockpile over the entire building and ramp areas. After the settlement rates become tolerable, the surcharge may be removed and excavated to elevation 10$\pm$ ft, then proofrolled. The fills may be reconstructed to grade in thin lifts compacted to 90% of ASTM D 1557-70 density.

The second method is to immediately remove the existing stockpiles to elevation 10$\pm$ ft, proofroll and reconstruct the fill in thin lifts up to grade over the building and ramp areas, then add 10 ft or more of additional surcharge. The surcharge may be removed just prior to building construction.

Ideally, fills and surcharge should be placed as soon as practicable to allow as much of the settlement to take place prior to construction.

The fill and surcharge should be built up at relatively slow rates and under controlled conditions, particularly along the stream banks. Settlement rates should be observed during the filling operations.

The site should be raised and graded for drainage purposes with allowances for future areal settlements.

Grading work should be done in general conformance with the Revised Ordinances of Honolulu, 1969 As Amended and the following additional guidelines:

1. Surface vegetation, miscellaneous debris, clay (CH) soils and concrete rubble should be cleared and removed prior to site filling and replaced with select materials compacted in 6-in. lifts.

   Backfill materials may be as follows:

   a. Below 2 ft of finish grade: 6-in. maximum size and a plasticity index of about 20.

   b. Top 2 feet: 3-in. maximum size and a plasticity index of about 20.

2. Localized soft spots encountered during the site preparation should be excavated and replaced with compacted select materials (City and County of Honolulu, Standard Specifications for Public Works Construction, May 1975, Select Borrow).

3. Provisions to drain the site should be included during and after the completion of filling operations.

4. Fills should be constructed in approximately level layers. Fills should be laid in 6-in. compacted layers to 90% of maximum density as determined by the ASTM D 1557-70 test method.

Slope Stability

The site is bordered on two sides by natural drainage streams. Fills of about 5 to 20 ft are proposed for the unloading platform and roadways along Kahauiki and Moanalua Streams.

The discontinuous edges of a fill along the water's edge are usually the most critical areas with regard to slope stability.

If construction of a fill along the bank proceeds too rapidly or the stream is dredged too deep, the fill and underlying soft soils may spread laterally or slump. Filling along the stream bank should be done at slow rates and preferably surcharged by overfilling. The rate of filling will depend on the properties of the underlying soft and loose materials. For construction scheduling, a fill rate of 1 ft per day for about the first 10 ft may be considered. This rate may reduce or increase depending upon field experience. Pore pressure and settlement readings may be used as a guide for determining the rate that fills may be placed above 10 ft. The fill should be made under controlled conditions and be carefully observed.

Along Kahauiki Stream, where fills of about 5 to 20 ft are planned for the roadway, Boring Nos. 6 and 12 indicated a soft peaty and clayey layer at about the water level. The peaty and clayey soils should be removed down to the silty-sandy materials and replaced with a well-graded granular material (City and County of Honolulu, Standard Specifications for Public Works Construction, May 1975, 2-1/2-in. maximum Base Course). See Figure 2. If this is not practicable, a pile supported structural system may be considered for the roadway.

Slopes

Generally, fill slopes of 2 horizontal to 1 vertical or flatter should be used in silty soils.

Where space limitation requires slope ratios of about 1-1/2 horizontal to 1 vertical, a buttress fill may be used (see Figure 3).

To reduce erosion, the runoff from rainstorms should be diverted away from slopes by berms or ditches whenever practicable. Slope planting is recommended on slopes.

The surface of all fill slopes should be compacted by cat-tracking or with a sheepsfoot roller.

Tops of slopes may tend to creep, and structures placed on the creep zone may be subjected to creep movements. To reduce the slope creep effects, if practicable, roadways and structures should be kept away from the tops of slopes a distance equal to the slope height with a minimum of about 5 ft, otherwise, some maintenance may be anticipated.

Spread Footing Foundations

Guidelines for spread footing foundation design are as follows:

1. Footings may rest on the well compacted materials.

2. Estimated allowable bearing pressures of about 1500 p.s.f. for footings on well compacted fills may be used.

   The soil pressure on the soft underlying soil layer should be less than 500 p.s.f. assuming that the pressure is distributed thru the crust according to the Boussinesq theory or by assuming that the pressure under a footing spreads outward with depth uniformly over an area bounded by planes drawn thru the outer edges of the footings at an inclination of about 30 degrees from the vertical.

3. Soft pockets encountered at the bottoms of footing excavations should be removed to a depth about equal to the footing width and replaced with select material (City and County of Honolulu, Standard Specifications for Public Works Construction, May 1975, Select Borrow) compacted in 6-in. lifts to 90% of ASTM D 1557-70 test method.

4. If foundations are located adjacent to a utility trench, the footings should be designed to span over the trench or extended below the bottoms of the trenches.

5. Footing excavations should be tamped before pouring concrete.

6. Foundations should be well-tied together with deep grade beams, particularly around the perimeter of the structure.

Pile Foundations

Guidelines for pile foundations are as follows:

1. In general, the piles should penetrate about 10 ft into the layers of stiff clayey silts. The estimated pile lengths below elevation 10$\pm$ ft may be in the order of about 60 to 100 ft or more.

2. The piles should be driven with a hammer delivering not more than 15,000 ft-lbs of energy. The piles should be set into the bearing stratum with about 10 ft of penetration or to about 40 blows per foot for 2 ft, 5 blows per inch for 2 in., but not to be overdriven to more than 10 blows for the last fraction of an inch.

3. Test piles should be driven for estimating pile lengths. The hammer used for test pile driving should be the same as that for production piles.

4. The piles should be placed as far apart as practicable and generally not less than 3 ft on centers.

5. Twelve-inch by 12-in. prestressed concrete piles designed for 25-ton estimated allowable loads may be considered. A low value is recommended because of the possibilities of loose underlying materials, earthquake, dragdown and other unforeseen forces.

6. Splicing of piles should be avoided, if practicable.

7. The pile driving contractor should observe that piles already in place are not heaved upward during pile driving. A pile that has been heaved upward should be redriven to its original position.

Retaining and Basement Walls

Retaining and basement walls up to about 20 ft are planned.

Subdrains (City and County of Honolulu, Standard Specifications for Public Works Construction, May 1975, Subsurface Drains) should be placed behind the walls below the footing level and should be daylighted at low points. Basement walls below the ground surface should be waterproofed.

Fairly well-graded granular material (City and County of Honolulu, Standard Specifications for Public Works Construction, May 1975, Select Borrow) or select granular material should be used for backfilling against walls.

Assuming a well-drained backfill, walls subjected to lateral earth pressures should be designed to resist estimated soil pressures approximating at-rest conditions as follows:

Walls restrained at top - 60 p.c.f. equivalent fluid pressure for walls above water.

Walls unrestrained at top - 45 p.c.f. equivalent fluid pressure for walls above water.

In addition, lateral pressure due to surcharge or live loads should be included.

The center of pressure should be considered to act somewhat above the lower third of the triangular fluid pressure diagram.

Estimated allowable bearing values of 1500 p.s.f. may be used for wall foundations resting on compacted fills. Toe pressures may be increased about 1/3 where a triangular pressure diagram is used along the base of the wall.

For sliding resistance between the base and subgrade, an estimated coefficient of friction of 0.35 may be used for silty subgrade provided the base of the wall is well drained, and there is sufficient (2 times the base) firm material in front of the toe of the wall. In addition, an estimated passive resistance of about 250 p.c.f. equivalent fluid may be used for the front of the wall. The top 1 ft should be neglected in computing the passive resistance.

<u>Slab on Ground</u>

Due to the soft underlying materials and anticipated settlements, the use of asphaltic concrete for the ground floors should be considered wherever practicable. When the settlements have reduced to tolerable rates, the floor may be finished over with concrete, if desired.

If practicable, concrete slabs on ground should be placed after the superstructure is constructed and should be separated from grade beams, walls and columns.

Where heavy vehicular loads such as forklifts are anticipated, a 6-in. thick concrete pavement over 6 in. of base course rock is recommended.

If a capillary break is required, 4 in. of well-graded gravel less than 3/4-in. and greater than 1/4-in. in size (No. 3 fine, crushed rock) over 2 in. of S4C may be substituted for the 6-in. base course rock or some other form of capillary break may be used. The base course layer should be placed over a prepared subgrade of sandy on-site soils.

If lighter loads and traffic are anticipated in some areas, the slab and base course thicknesses may be reduced.

<u>Roadway and Parking Areas</u>

For the anticipated truck traffic and drained subgrade conditions, the driveway and parking area pavement section for the general soil conditions may be as follows:

1. Wearing course - 2-1/2-in. asphaltic concrete.

2. Base course - 8-in. base course over a prepared subgrade with CBR 12.

Provisions should be made in the contract documents to allow for local adjustments regarding select borrow subbase and borrow material requirements in the field.

The subgrade should be well drained. Outlets should be provided at low points of the paved areas to avoid water pocketing at the subgrade level. Where catch basins are placed in low areas, weep holes should be placed at subgrade levels through the walls of the catch basins.

If container loads are to be used, the use of concrete sleepers should be considered to protect the pavements from the loads of the steel wheels.

Utilities

Utilities should be placed after the fills are constructed. Utility lines should be designed with flexible joints, particularly where lines are connected to structures.

Joint and Connection Details

Some differential settlements are to be expected between the building elements. Joints and connections should be detailed to allow some movements or releveling and adjustments at a later date should differential settlements become objectionable.

The steel column to footing connections should be detailed to allow for jacking and leveling the superstructure at some later date.

To minimize the wavy surface effects at the ground floor level due to differential settlements or heaving, non-bearing partitions, doors, cabinets, etc., should be designed with loose fits and other precautions taken to allow for some future adjustments or maintenance.

Driveways, sidewalks and entry slabs next to the buildings should be supported on hinged seats that would permit some rotation and maintain a smooth transition to the building.

Future Construction

If any future construction work such as additional fills, dredging of streams or utilities requiring deep excavation or dewatering is done on or near the site, additional settlements may occur.

Field Adjustments

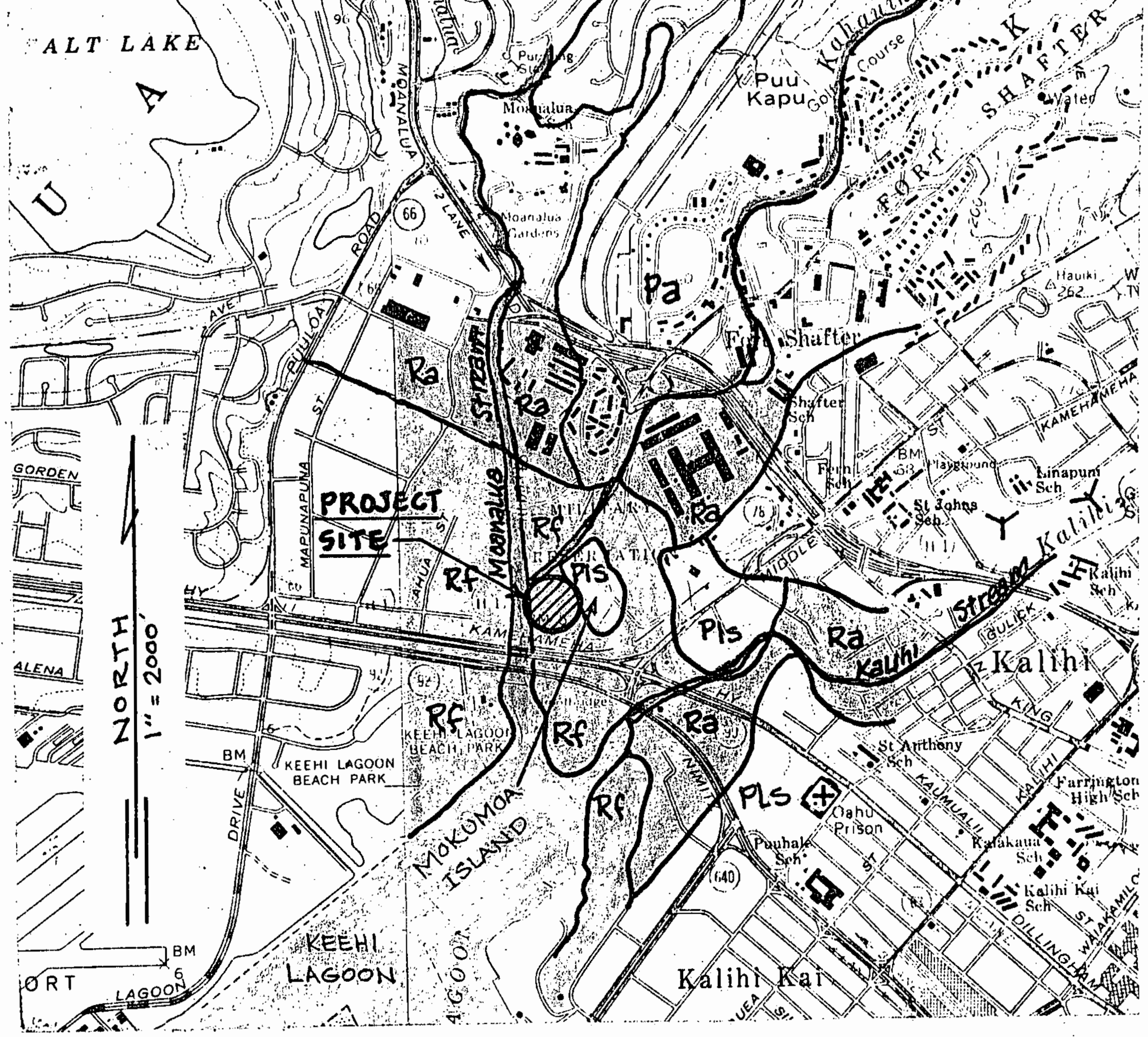
Provisions should be made in the contract documents to allow for local adjustments in the field regarding overexcavation, select borrow, etc.

Unforeseen Conditions

Because of the variability of soil deposits, site improvements, designs and construction techniques, existing or changed conditions may be encountered that cannot be foreseen with even the most exhaustive studies of site and project conditions.

These unforeseen conditions should be recognized when encountered and then evaluated so that the designs or the construction methods may be modified accordingly, if necessary.

Unforeseen or changed or undetected conditions such as soft spots, existing utility trenches, underground structures, pipes, voids or cavities, boulders, expansive soil pockets, seepage water or water level changes with weather, etc., may occur in localized areas and will have to be adjusted and corrected in the field as they are detected.



EXPLANATION

Rf	Artificial Fill, Marine deposits dredged from ocean floor
Ra	Unconsolidated Noncalcareous Deposits, Chiefly younger alluvium
Pa	Consolidated Noncalcareous Deposits, Chiefly older alluvium
Pls	Consolidated Calcareous Marine Sediments, Chiefly emerged coral reefs

The data and boundaries of soil conditions are approximations only based on field data and reconnaissance.

FIGURE 1

GENERAL GEOLOGIC SKETCH*
SHAFTER FLATS REFUSE PROCESSING & TRANSFER STATION
HONOLULU, OAHU, HAWAII
TAX MAP KEY: 1-1-6: POR. 3

* Adapted from Geology by H. Stearns, 1938

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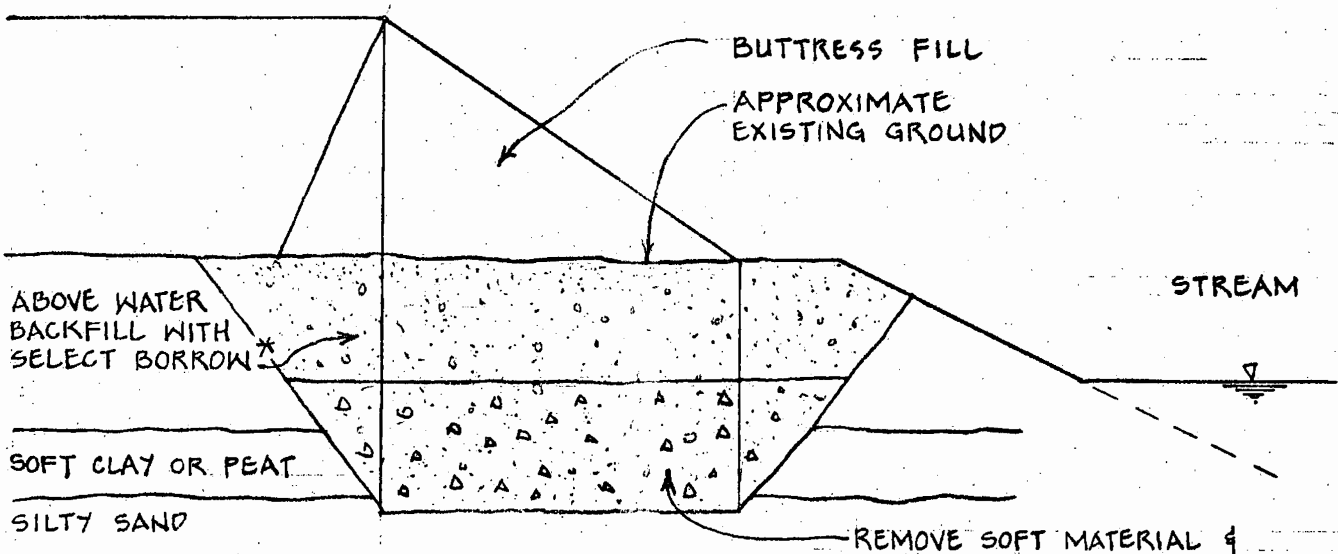


FIGURE 2 : SCHEMATIC SECTION

NOT TO SCALE

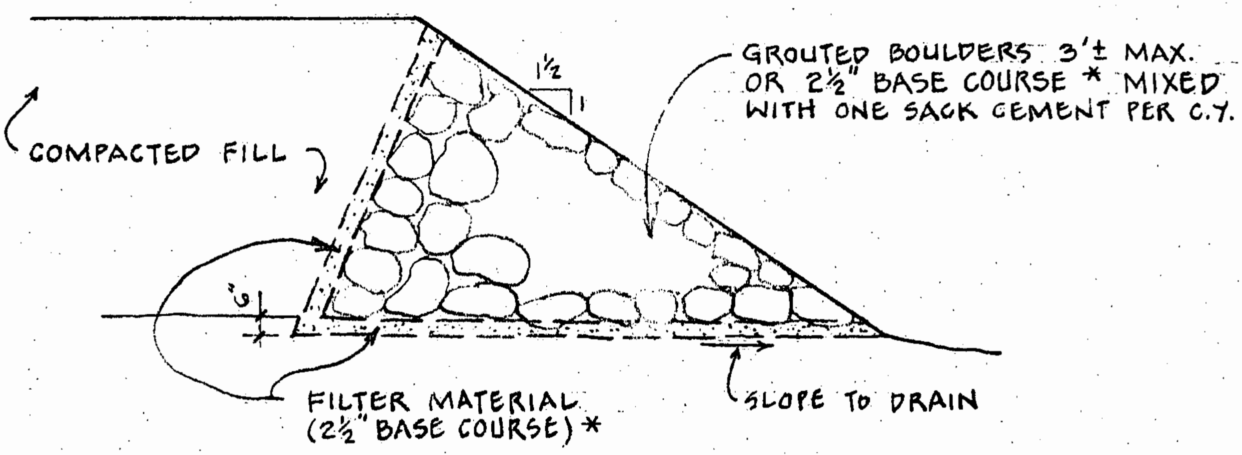


FIGURE 3: SUGGESTED BUTTRESS FILL

NOT TO SCALE

*FOR MATERIAL SPECIFICATIONS, REFER TO C & C HONOLULU, DEP'T OF PUBLIC WORKS, STANDARD SPECIFICATIONS FOR PUBLIC WORK CONST., MAY, 1975.

SHAFTER FLATS REFUSE
PROCESSING & TRANSFER STATION
HONOLULU, OAHU, HAWAII

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

DECEMBER, 1975

BORING LOGS

The stratification lines shown on each of the boring logs represent the approximate boundary between soil types and the transition may be gradual.

Symbols

Symbols used generally are in accordance with the Unified Soil Classification System.

Where a parenthesis "(MH)" is used, the soil sample was classified by visual observation of the sample recovered.

Where no parenthesis "MH" is used, the soil sample was classified from either the Atterberg limit or grain-size analysis test results.

PENETRATION DATA

Standard Penetration Test — 2" O.D. THIN WALL TUBE

Unified Soil Classification	DESCRIPTION ELEV. = 10' ± *	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	N (Blows per foot) 0 10 20 30 40
(SM)	LOOSE, BROWN SILTY SAND W/TRACES OF CORAL, GRASS & WOOD (FILL?)	0	2"SS	G-A	–	6	–	–	–	3 BLOWS/1.0'
	CORAL & SAND (CUTTINGS)	5								
(SM)	MEDIUM DENSITY, TAN SILTY SAND (FINE)		2"SS	G-B	–	7	–	–	–	45
CL	SOFT, TAN & GRAY CLAY	10	2"SS WATER 11-6-75	G-C	27	53	49	–	–	2 BLOWS/1.0'
(OH-PT)	SOFT, GRAY BROWN ORGANIC CLAYS & SILTS (PEATY)					102				
(GM)	DENSE, GRAY SILTY CORAL W/TRACES OF SHELLS & SAND	15	2"SS	G-D	–	50	–	–	–	24/0.1'
GM	DENSE, TAN-WHITE SILTY CORAL	20	2"SS	G-E	–	24	–	–	–	51
(GP-GM)	MEDIUM DENSITY TAN-WHITE, CORAL W/TRACES OF SHELLS	25	2"SS	G-F	–	19	–	–	–	
(GP)	MEDIUM DENSITY, TAN CORAL	30	2"SS	G-G	–	17	–	–	–	2 BLOWS/0.5' 9/0.5'
(GP-GM)	MEDIUM DENSITY, TAN CORAL W/SAND	35	2"SS	G-H	–	22	–	–	–	
		40	2"SS	G-I	–	18	–	–	–	
(GC)	LOOSE, TAN CLAYEY CORAL	45	2"SS	G-J	–	29	–	–	–	
(MH)	STIFF, MOTTLED BROWN SILTY CLAY W/SAND, GRAVEL & TRACES OF RIVER GRAVEL	50	2"SS	G-K	–	36 57	–	–	–	
(GM)	DENSE MOTTLED GRAY BROWN SILTY SAND & GRAVEL W/MUDROCK FRAGMENTS & DECOMPOSED ROCK	55	2"SS	G-L	–	38	–	–	–	51
(SM)	DENSE, MOTTLED GRAY BROWN SILTY SAND W/DECOMPOSED ROCK	60	2"SS	G-M	–	31 68	–	–	–	44
(MH)	STIFF, BROWN & BLACK CLAYEY SILT									
(SM)	DENSE DARK MOTTLED BROWN SILTY SAND W/ GRAVEL	65	2"S	G-N	–	57 48	–	–	–	HYDRAULIC PRESSURE 450 PSI/1.5'
(GM)	DENSE MOTTLED GRAY BROWN SILTY GRAVEL W/SAND & DECOMPOSED ROCK	70	2"SS	G-O	–	34	–	–	–	47
	END OF BORING @ 71.5' 11-6-75									

*ELEVATION ESTIMATED FROM TOPO MAP BY R.M. TOWILL CORP. DATED 3-31-75

Tax Map Key: 1-1-6: Por. 3

HAMMER:
Weight 140#
Drop 30"

SAMPLER: 2" STANDARD SPLIT SPOON

Type of Boring [illegible] Diam.
Elev. 25'± * Datum —
Drill Bit FINGER TYPE

Water Level 22.0'
Time 10:00AM
Date 11-11-75

Unified Soil Classification	DESCRIPTION ELEV. = 25'± *	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA Standard Penetration Test N (Blows per foot) 0 10 20 30 40
(SM)	DENSE, MOTTLED BROWN SILTY SAND W/ DECOMPOSED ROCK & GRAVEL	0		7-A	–	15	–	–	–	
		5		7-B	–	–	–	–	–	
(MH-CH)	STIFF, MOTTLED BROWN SILTY CLAY W/TRACES OF DECOMPOSED ROCK & SAND	10		7-C	–	28	–	–	–	
(SM)	DENSE, TAN SILTY SAND	15		7-D	–	10	–	–	–	46
(CH)	SOFT, DARK GRAY CLAY W/SAND, SHELLS & CORAL	20	WATER 11-11-75	7-E	–	30	–	–	–	
(GC)	LOOSE, TAN GRAY CLAYEY SAND & CORAL									
(GM)	LOOSE, TAN & WHITE SILTY SAND & CORAL W/TRACES OF CLAY	25		7-F	–	69 43 21	–	–	–	5/0.5 21/0.5'
(GP-GC)	DENSE, TAN & WHITE SILTY SAND & CORAL									
(SM)	DENSE TAN & LIGHT GRAY SILTY SAND W/CORAL	30		7-G	–	22 16	–	–	–	
(GP-GM)	DENSE, TAN & WHITE SILTY SAND & CORAL									
		35		7-H	–	32	–	–	–	
(GM)	MEDIUM DENSITY, TAN SILTY SAND & CORAL	40		7-I	–	31	–	–	–	
		45		7-J	–	26	–	–	–	8/0.5' 3/0.5'
(SM)	LOOSE, TAN SILTY SAND & CORAL W/TRACES OF CLAY	50		7-K	–	28	–	–	–	3/1.0'
(GC)	MEDIUM DENSITY, TAN CLAYEY CORAL W/SAND	55		7-L	–	29	–	–	–	
(SM)	MEDIUM DENSITY TAN & LIGHT BROWN SILTY SAND & CORAL	60		7-M	–	22	–	–	–	
		65		7-N	–	11	–	–	–	
(GM)	MEDIUM DENSITY TAN-GRAY SILTY CORAL W/SAND	70		7-O	–	20	–	–	–	
	END OF BORING @ 71.5' 11-11-75									

*ELEVATION ESTIMATED FROM TOPO MAP BY R.M. TOWILL CORP. DATED 3-31-75

ELEV. = 14'± *

Unified Soil Classifica	DESCRIPTION	Depth (Ft.	Sampler	Sample N	Plastic Lim	Water Cor %	Liquid Lim	Unconf. C P.S.F.	Vane Shea P.S.F.	Penetration Test N (Blows per foot) 0 10 20 30 40	THIN WALL TUBE BLOWS/0.5'
(SM)	MEDIUM DENSITY, BROWN SILTY SAND W/GRAVEL & CORAL	0	2"SS	8-A	–	14	–	–	–		
(SM)	DENSE, MOTTLED BROWN SILTY SAND W/DECOMPOSED ROCK	5	2"SS	8-B	–	20	–	–	–		30/0.5' HAMMER BOUNCES
	MOTTLED BROWN DECOMPOSED MUDROCK	10	2"SS	8-C	–	19	–	–	–		
(MH)	SOFT GRAY BROWN SILTY CLAY W/SAND, CORAL & SHELLS	15	2"SS	8-D	–	29	–	–	–		
(MH)	SOFT, DARK GRAY SILTY CLAY W/SAND & CORAL	20	2"SS	8-E	–	29	– γ_W = 117 γ_D = 91	1250	–		4/0.5' 6/0.5'
			WATER 11-12-75								
(OH)	SOFT, DARK GRAY ORGANIC SILTS & CLAYS W/TRACES OF ROOTS & SHELLS	25	2"SS	8-F	–	72	–	–	–		
		30	2"S	8-G	–	36	– γ_W = 114 γ_D = 84	250	–		1/0.5' 1/0.5' 2/0.5'
		35	2"SS	8-H	–	40	–	–	–		
		40	2"SS	8-I	–	60	–	–	–		
(GC)	LOOSE, GRAY CLAYEY CORAL W/SAND										
		45	2"SS	8-J	–	33	–	–	–		
		50	2"SS	8-K	–	32	–	–	–		
		55	2"SS	8-L	–	35	–	–	–		
(SC)	LOOSE, LIGHT GRAY CLAYEY SAND W/CORAL	60	2"SS	8-M	–	29	–	–	–		
(GC)	MEDIUM DENSITY, TAN CLAYEY CORAL	65	2"SS	8-N	–	26	–	–	–		
(SC)	MEDIUM DENSITY TAN GRAY CLAYEY SAND W/CORAL	70	2"SS	8-O	–	16	–	–	–		
(SC)	MEDIUM DENSITY, TAN CLAYEY SAND W/CORAL	75	2"SS	8-P	–	22	–	–	–		
(CH)	STIFF MOTTLED GRAY BROWN CLAY	80	2"SS	8-Q	–	74	–	–	–		

END OF BORING @ 81.5'
11-12-75

*ELEVATION ESTIMATED FROM TOPO MAP BY R.M. TOWILL CORP. DATED 3-31-75

NOTE: γ_W = WET DENSITY, P.C.F.
γ_D = DRY DENSITY, P.C.F.

(GC)	CLAYEY CORAL W/SAND & SHELLS		3"S	9-E	–	46	– γ_W= 114 γ_D= 78	–	–	1/0.5' 2/0.5' 3/0.5'
(SC)	MEDIUM DENSITY MOTTLED GRAY CLAYEY SAND W/CORAL	25								
(MH)	STIFF MOTTLED GRAY BROWN SILTY CLAY W/TRACES OF SAND & CORAL		2"SS	9-F	–	47 40	–	–	–	
SC	MEDIUM DENSITY, TAN CLAYEY SAND W/CORAL & SHELLS	30	2"SS	9-G	–	38	–	–	–	
(CL)	MEDIUM MOTTLED TAN SANDY CLAY W/CORAL	35	2"SS	9-H	–	35	–	–	–	
(GC)	MEDIUM DENSITY, TAN CLAYEY CORAL W/SAND	40								
(CH)	STIFF, BROWN CLAY W/ CORAL & SAND		2"SS	9-I	–	29 47	–	–	–	
(GC)	MEDIUM DENSITY, TAN CLAYEY CORAL W/SAND	45	2"SS	9-J	–	29	–	–	–	
(CL-CH)	STIFF, TAN GRAY CLAY W/ CORAL & SAND	50	2"SS	9-K	–	35	–	–	–	
	TAN DECOMPOSED CORAL	55	2"SS	9-L	–	22 70	–	–	–	
(MH)	MEDIUM-STIFF GRAY BROWN CLAYEY SILT									
(CH)	MEDIUM LIGHT GRAY TAN CLAY	60	2"SS	9-M	–	52	–	–	–	
(MH)	STIFF MOTTLED GRAY BROWN CLAYEY SILT	65	2"SS	9-N	–	83 45	–	–	–	
(CH)	STIFF LIGHT GRAY TAN CLAY	70	2"SS	9-O	–	37	–	–	–	
		75	2"SS	9-P	–	60	–	–	–	
(MH)	STIFF, GRAY BROWN SILTY CLAY (PARTLY ORGANIC)	80	2"SS	9-Q	–	57	–	–	–	
		85	2"SS	9-R	–	61	–	–	–	
(CH)	STIFF, GRAY CLAY (PARTLY ORGANIC)	90	2"S	9-S	–	54	– γ_W= 110 γ_D= 71	3030	1500 1160 1760 1920 1880	3/0.5' 7/0.5'
(MH)	STIFF, MOTTLED BROWN SILTY CLAY W/TRACES OF SHELLS	95	2"SS	9-T	–	51	–	–	–	
(MH)	STIFF, MOTTLED BROWN SILTY CLAY W/TRACES OF DECOMPOSED ROCK	100	2"SS	9-U	–	46	–	–	–	

END OF BORING @ 101.5'
11-14-75

NOTE: γ_W= WET DENSITY, P.C.F.
γ_D= DRY DENSITY, P.C.F.

*ELEVATION ESTIMATED FROM TOPO MAP BY R.M. TOWILL CORP. DATED 3-31-75

Unified Soil Classification	Description	Depth (Ft)	Sampler	Sample No.	Plastic Limit	Water Content %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	Penetration Test N (Blows per foot) 0 10 20 30 40
	ELEV. = 40'±	0								
		5								
		10								
	NOTE: ROUGH DRILLING 0.0' - 25.0'. FILL MATERIAL	15								
		20								
(SM)	MEDIUM DENSITY GRAY BROWN SILTY SAND (FILL?)	25		10-A	-	9	-	-	-	
(MH)	STIFF, BROWN SILTY CLAY W/ SAND, CORAL & GRAVEL (FILL?)	30		10-B	-	22 40	-	-	-	
(ML-MH)	MOTTLED BROWN CLAYEY SILT W/ SAND (FILL?)									
(SM)	MEDIUM DENSITY - DENSE TAN, SILTY FINE SAND	35	WATER 11-13-75	10-C	-	26 20	-	-	-	40
(GP-GM)	MEDIUM DENSITY, TAN CORAL W/TRACES OF SAND	40		10-D	-	19	-	-	-	
(CH)	MEDIUM, GRAY CLAY (PARTLY ORGANIC)	45		10-E	-	60	-	-	-	
(GC)	LOOSE, GRAY CLAYEY CORAL W/TRACES OF SAND & SHELLS	50		10-F	-	47	-	-	-	
(GC)	LOOSE, GRAY CLAYEY CORAL	55		10-G	-	53	-	-	-	
(GC)	LOOSE, GRAY CLAYEY CORAL W/TRACES OF SHELLS	60		10-H	-	58	-	-	-	
(GH)	MEDIUM, GRAY CLAY W/ CORAL & SHELLS	65		10-I	-	59	-	-	-	
(GC)	LOOSE, TAN GRAY CLAYEY CORAL	70		10-J	-	30	-	-	-	
(CH)	STIFF MOTTLED GRAY BROWN CLAY	75		10-K	-	42	-	-	-	
		80		10-L	-	39	-	-	-	
	END OF BORING @ 81.5' 11-13-75									
	* ELEVATION ESTIMATED FROM TOPO MAP BY R.M. TOWILL CORP. DATED 3-31-75									

(CH)	SOFT, GRAY CLAY W/TRACES OF SAND & CORAL		2"SS	11-F	-	49	-	-	-	5/0.5' 2/0.5'	
CH	MEDIUM, DARK BROWN CLAY	30	2"S	11-G	41	76	102 γ_w=97 γ_D=55	-	700 700		HYDRAULIC PRESSURE 50 PSI/1.5'
		35	2"SS	11-H	-	65	-	-	-	4/0.5' 1/0.5'	
		40	2"S	11-I	-	63	- γ_w=99 γ_D=61	-	500 500		HYDRAULIC PRESSURE 200 PSI/1.5'
(CH)	SOFT, GRAY CLAY (PARTLY ORGANIC)	45	2"SS	11-J	-	65	-	-	-	2 BLOWS/1.0'	
		50	2"S	11-K	-	62	- γ_w=103 γ_D=63	1000 1060	700 700		1 MAN PUSH/1.5'
		55	2"SS	11-L	-	66	-	-	-	WT. OF RODS/1.5'	
CH	SOFT, GRAY CLAY W/TRACES OF SHELLS	60	2"S	11-M	-	62	- γ_w=101 γ_D=62	-	700 600		2 MAN PUSH/1.5'
		65	2"SS	11-N	-	62	-	-	-	WT. OF HAMMER/1.5'	
		70	2"S	11-O	32	58	73 γ_w=103 γ_D=65	-	840 840		2 MAN PUSH/1.5'
		75	2"SS	11-P	-	54	-	-	-	WT. OF HAMMER/1.5'	
CH	SOFT, GRAY TAN CLAY	80	2"SS	11-Q	24	46	53	-	-	WT. OF RODS/1.5'	
		85									
(SC)	LOOSE, GRAY CLAYEY SAND W/TRACES OF SHELLS	90	2"S	11-R	-	34	- γ_w=122 γ_D=91	120	200		HYDRAULIC PRESSURE 50 PSI/1.5'
		95									
(CH)	STIFF, GRAY CLAY W/DECOMPOSED CORAL & SHELLS	100	2"SS	11-S	-	39	-	-	-		
		105				CONTINUOUS PENETRATION TEST W/2" DIAM. BLUNT POINT					
	END OF BORING @ 107' 10-20-75										

NOTE:
γ_w: WET DENSITY, P.C.F.
γ_D: DRY DENSITY, P.C.F.

* ELEVATION ESTIMATED FROM TOPO MAP BY R.M. TOWILL CORP. DATED: 3-31-75

SAMPLER: 2" S - 2" O.D. THIN WALL TUBE

PENETRATION DATA: Standard Penetration Test; 2" & 3" O.D. THIN WALL TUBE SAMPLER

Unified Soil Classification	DESCRIPTION ELEV. = 6' ± 2'*	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	N (Blows per foot) 0 10 20 30 40
(SM)	DENSE TO MEDIUM DENSITY TAN, SILTY SAND W/TRACES OF CORAL	0	2"SS	12-A	-	3	-	-	-	
		5	2"SS	12-B	-	21 32	-	-	-	
(SM)	MEDIUM DENSITY, GRAY SILTY SAND		WATER 11-7-75							
CH	SOFT, GRAY CLAY	10	2"SS	12-C	31	60 50	74	-	-	2 BLOWS/1.0'
(MH)	SOFT DARK GRAY BROWN SILTY CLAY W/SAND (PARTLY ORGANIC)									
(SC)	LOOSE, DARK GRAY CLAYEY SAND, CORAL & SHELLS	15	3"S	12-D	NO RECOVERY					MAN PUSH /1.0' 3/0.5'
			2"SS	12-E	-	38	-	-	-	2 BLOWS/1.0'
		20	3"S	12-F	-	66 27	γ_W = 123 γ_D = 74		-	1/0.5' 2/0.5' 2/0.5'
SC	LOOSE, GRAY CLAYEY CORAL & SAND W/SHELLS	25	2"SS	12-G	-	47	-	-	-	2 BLOWS/1.0'
		30	3"S	12-H	-	38 38	γ_W = 86 γ_D = 62		-	2/0.5' 2/0.5' 2/0.5'
(CH)	SOFT, GRAY CLAY & CORAL W/SAND	35	2"SS	12-I	-	69	-	-	-	
(SM)	LOOSE, GRAY SILTY SAND W/CORAL	40	3"S	12-J	-	37	-	-	-	5/0.5' 4/0.5' 5/0.5'
(GC)	LOOSE, TAN GRAY CLAYEY CORAL W/SAND	45								
(MH)	MEDIUM, MOTTLED BROWN SILTY CLAY		2"SS	12-K	-	28 59 20	-	-	-	5/0.5' 33/0.5'
(GC)	DENSE, TAN CLAYEY CORAL & SAND									
(GC)	LOOSE, LIGHT TAN CLAYEY CORAL	50	2"S	12-L	-	40	- γ_W = 112 γ_D = 80	-	-	HYDRAULIC PRESSURE 300 PSI/1.5'
	DENSE COARSE SAND	55	2"SS	12-M	-	14	-	-	-	20/0.1' HAMMER BOUNCES
(SC)	DENSE, TAN WHITE CLAYEY SAND & CORAL	60	2"SS	12-N	-	20	-	-	-	40
(CH)	MEDIUM TO STIFF TAN BROWN, CLAY (DECOMPOSED CORAL)	65	2"SS	12-O	-	36	-	-	-	
(MH)	STIFF, BROWN CLAYEY SILT W/SAND	70	2"SS	12-P	-	39 64 33	-	-	-	
	TAN, DECOMPOSED ROCK W/CLAY									
	END OF BORING @ 71.5' 11-7-75									

NOTE:
γ_W: WET DENSITY, P.C.F.
γ_D: DRY DENSITY, P.C.F.

*ELEVATION ESTIMATED FROM TOPO MAP BY R.M. TOWILL CORP. DATED 3-31-75

CH	CLAY (PARTLY ORGANIC)	40	2"S	13-G	-	71 73 67	-	560 910	560 580 660 540	1-MAN PUSH / 1.5'
		45							250**	
		50	2"S	13-H	-	81 68 74	-	γ_W = 99 γ_D = 55 750	480 420 520 500	WT. OF RODS / 1.5'
		55							140**	
		60	2"S	13-I	-	69 71 68	-	γ_W = 100 γ_D = 59 900	560 600 620 440 520 500 600	WT. OF RODS / 1.5'
		65							115**	
		70	2"S	13-J	-	74	- γ_W = 96 γ_D = 55	448 1050	-	WT. OF RODS / 1.5'
		75							325**	
(CH)	SOFT, GRAY CLAY (PARTLY ORGANIC)	80		NOTE: γ_W = WET DENSITY, P.C.F. γ_D = DRY DENSITY, P.C.F.						
		85								
		90								
		95								
		100								
OH	SOFT, GRAY ORGANIC CLAYS & SILTS	110	2"S	13-K	41	67 69 69	82	1470 1590	840 880 920 860	WT. OF RODS / 1.5'
									WT. OF RODS / 1.5'; 1/0.5'; 3/0.5'	CONTINUOUS PENETRATION TEST W/2" DIAM. BLUNT POINT
		115								
		120								
		125								
	END OF BORING @130' 10-9-75	130		** FIELD VANE TEST						

* ELEVATION ESTIMATED FROM TOPO MAP BY R.M. TOWILL CORP. DATED 3-31-75

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: SHAFTER FLATS REFUSE PROCESSING & TRANSFER STATION

LOCATION: Honolulu, Oahu, Hawaii
Tax Map Key: 1-1-6: Por. 3

HAMMER:
Weight: 140#
Drop: 30"

SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 14 Sheet No. ____ of ____

Driller: W. LUM ASSOC., INC. Date: NOV. 17, 1975

Field Party: MEYER, KAU, ASATO

Type of Boring: AUGER (MOBILE B-40) Diam.: 6" HOLLOW STEM

Elev.: 35'± * Datum: —

Drill Bit: FINGER TYPE

Water Level: NOT MEASURED
Time:
Date: 11-17-75

Unified Soil Classification	Description	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	Penetration Data: Standard Penetration Test N (Blows per foot) 0 10 20 30 40
	ELEV. = 35'±	0								
		5								
		20								
		25								
	NOTE: TOP 30'± FILL MATERIAL									
		30								
		35								
(SM)	MEDIUM DENSITY, TAN SILTY SAND W/CORAL	40		14-A	–	22 19	–	–	–	
		45								
(CH)	SOFT, DARK GRAY CLAY	50		14-B	–	52	–	–	–	
	END OF BORING @ 51.5' 11-17-75									
	*ELEVATION ESTIMATED FROM TOPO MAP BY R.M. TOWILL CORP. DATED 3-31-75									

SHAFTER FLATS REFUSE PROCESSING & TRANSFER STATION

TABLE IA - SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	6	6	9	9
SAMPLE NO.	C (TOP)	E	C	G
DEPTH BELOW SURFACE	10'-11.5'	20'-21.5'	10'-11.5'	30'-31.5'
DESCRIPTION	TAN & GRAY CLAY	TAN-WHITE SILTY CORAL	GRAY SILTY SAND W/SHELLS	TAN CLAYEY SAND W/CORAL & SHELLS
GRAIN-SIZE ANALYSIS				
(% Passing)				
Sieve				
1-1/2"		100	100	100
1"		100	100	100
1/2"		76.5	100	98.2
#4		50.4	98.8	89.8
#10		38.3	97.1	77.8
#20		31.1	96.1	66.2
#40		27.1	94.2	59.2
#100		19.6	63.1	39.0
#200		15.0	31.9	29.8
ATTERBERG LIMITS				
Air Dried or Natural	NATURAL			
Liquid Limit	49			
Plastic Limit	27			
Plasticity Index	22			
Dilatancy	SLOW			
Toughness	MED STIFF			
Dry Strength	MEDIUM			
UNIFIED SOIL CLASSIFICATION	CL	GM	SM	SC
APPARENT SPECIFIC GRAVITY				
CBR TEST				
(Surcharge - 51 P.S.F.)				
Molding Moisture, %				
Molding Dry Density, P.C.F.				
Swell upon saturation, %				
CBR at 0.1" Penetration				
MOISTURE-DENSITY RELATIONS OF SOILS				
(ASTM D-1557-70, Method ___)				
Dry to Wet or Wet to Dry				
Max. Dry Density (P.C.F.)				
Optimum Moisture (%)				

REMARKS:

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

Date 12-9-75 By BT

SHAFTER FLATS REFUSE PROCESSING & TRANSFER STATION

TABLE I B - SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	11	11	11	12
SAMPLE NO.	G	O	Q	C (TOP)
DEPTH BELOW SURFACE	30'-31.5'	70'-71.5'	80'-81.5	10'-11.5'
DESCRIPTION	DARK BROWN CLAY	GRAY CLAY W/TRACES OF SHELLS	GRAY-TAN CLAY	GRAY CLAY
GRAIN-SIZE ANALYSIS				
(% Passing)				
Sieve				
1-1/2"				
1"				
1/2"				
#4				
#10				
#20				
#40				
#100				
#200				
ATTERBERG LIMITS				
Air Dried or Natural	NATURAL	NATURAL	NATURAL	NATURAL
Liquid Limit	102	73	53	74
Plastic Limit	41	32	24	31
Plasticity Index	61	41	29	43
Dilatancy	SLOW	SLOW-NONE	SLOW-RAPID	SLOW
Toughness	MED. STIFF	MED. STIFF	MED. STIFF	VERY STIFF
Dry Strength	HIGH	MED.-HIGH	MED. STIFF	HIGH
UNIFIED SOIL CLASSIFICATION	CH	CH	CH	CH
APPARENT SPECIFIC GRAVITY				
CBR TEST				
(Surcharge - 51 P.S.F.)				
Molding Moisture, %				
Molding Dry Density, P.C.F.				
Swell upon saturation, %				
CBR at 0.1" Penetration				
MOISTURE-DENSITY RELATIONS OF SOILS				
(ASTM D-1557-70, Method ___)				
Dry to Wet or Wet to Dry				
Max. Dry Density (P.C.F.)				
Optimum Moisture (%)				

REMARKS:

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

Date 12-9-75 By BT

SHAFTER FLATS REFUSE PROCESSING & TRANSFER STATION

TABLE I C - SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	12	13	13	13
SAMPLE NO.	F (BTM.)	E	F	K
DEPTH BELOW SURFACE	20'-21.5'	20'-21.5'	30'-32'	110'-111.5'
DESCRIPTION	GRAY CLAYEY CORAL & SAND W/SHELLS	DARK GRAY ORGANIC CLAYS & SILTS	DARK GRAY CLAY (PARTLY ORGANIC)	GRAY ORGANIC CLAYS & SILTS
GRAIN-SIZE ANALYSIS				
(% Passing)				
Sieve				
1-1/2"	100			
1"	100			
1/2"	88.0			
#4	64.7			
#10	53.4			
#20	44.7			
#40	40.0			
#100	32.1			
#200	27.6			
ATTERBERG LIMITS				
Air Dried or Natural		NATURAL	NATURAL	NATURAL
Liquid Limit		93	79	82
Plastic Limit		46	35	41
Plasticity Index		47	44	41
Dilatancy		SLOW-RAPID	SLOW	SLOW-RAPID
Toughness		MED. STIFF	MED. STIFF	MED. STIFF
Dry Strength		MED.-HIGH	HIGH	MED.-HIGH
UNIFIED SOIL CLASSIFICATION	SC	OH	CH	OH
APPARENT SPECIFIC GRAVITY				
CBR TEST				
(Surcharge - 51 P.S.F.)				
Molding Moisture, %				
Molding Dry Density, P.C.F.				
Swell upon saturation, %				
CBR at 0.1" Penetration				
MOISTURE-DENSITY RELATIONS OF SOILS				
(ASTM D-1557-70, Method ___)				
Dry to Wet or Wet to Dry				
Max. Dry Density (P.C.F.)				
Optimum Moisture (%)				

REMARKS:

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

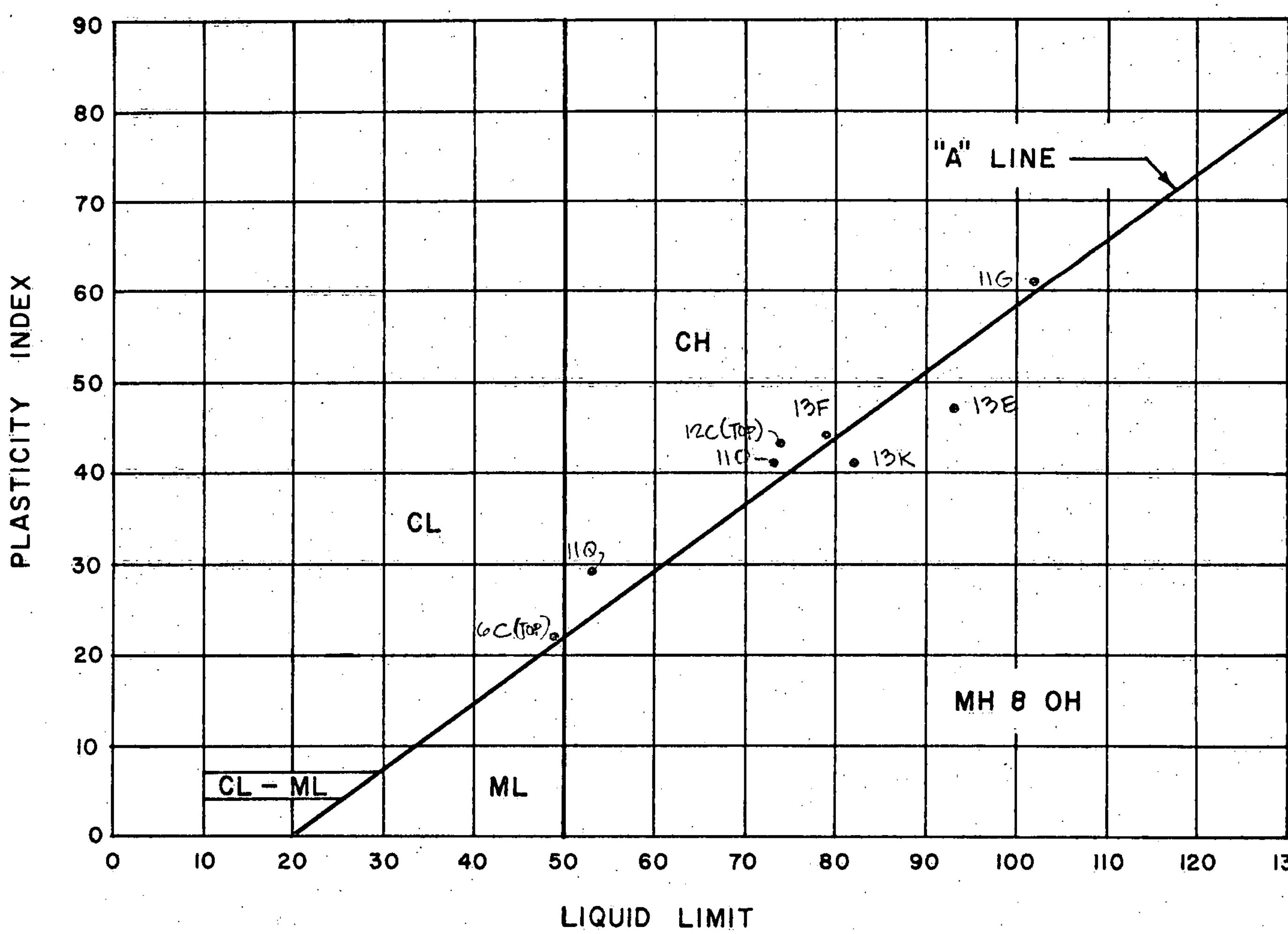
Date 12-9-75 By BT

?-775

PLASTICITY CHART

PROJECT: SHAFTER FLATS REFUSE PROCESSING & TRANSFER STATION

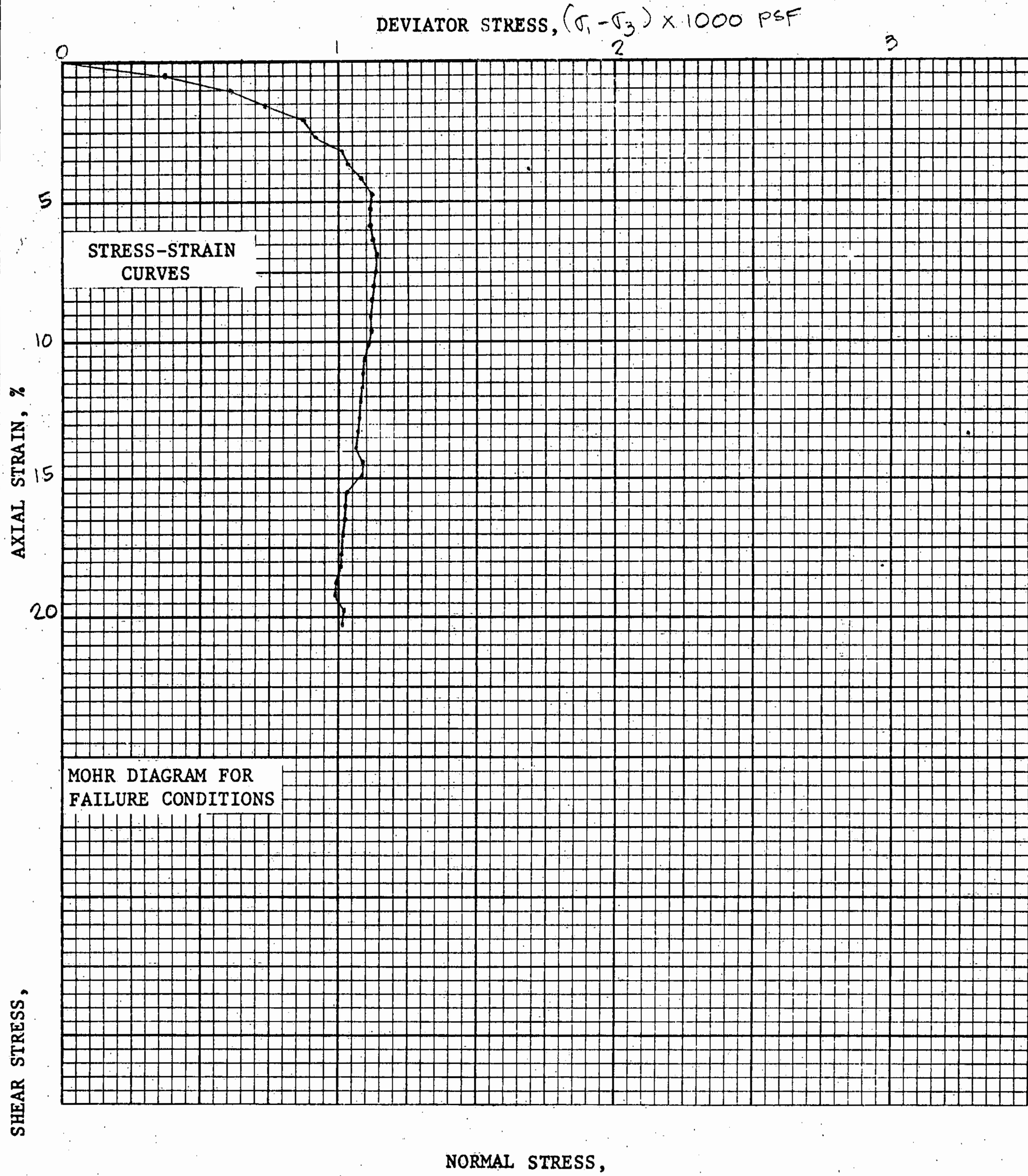
LOCATION: HONOLULU, OAHU, HAWAII



DATE 12-9-75 BY BT

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

8-872



SAMPLE DESCRIPTION	SAMPLE SIZE	ATTERBERG LIMITS	REMARKS
DARK GRAY CLAY	2 7/8" DIA X 6" H.	LL= 102 PL= 41 PI= 61	

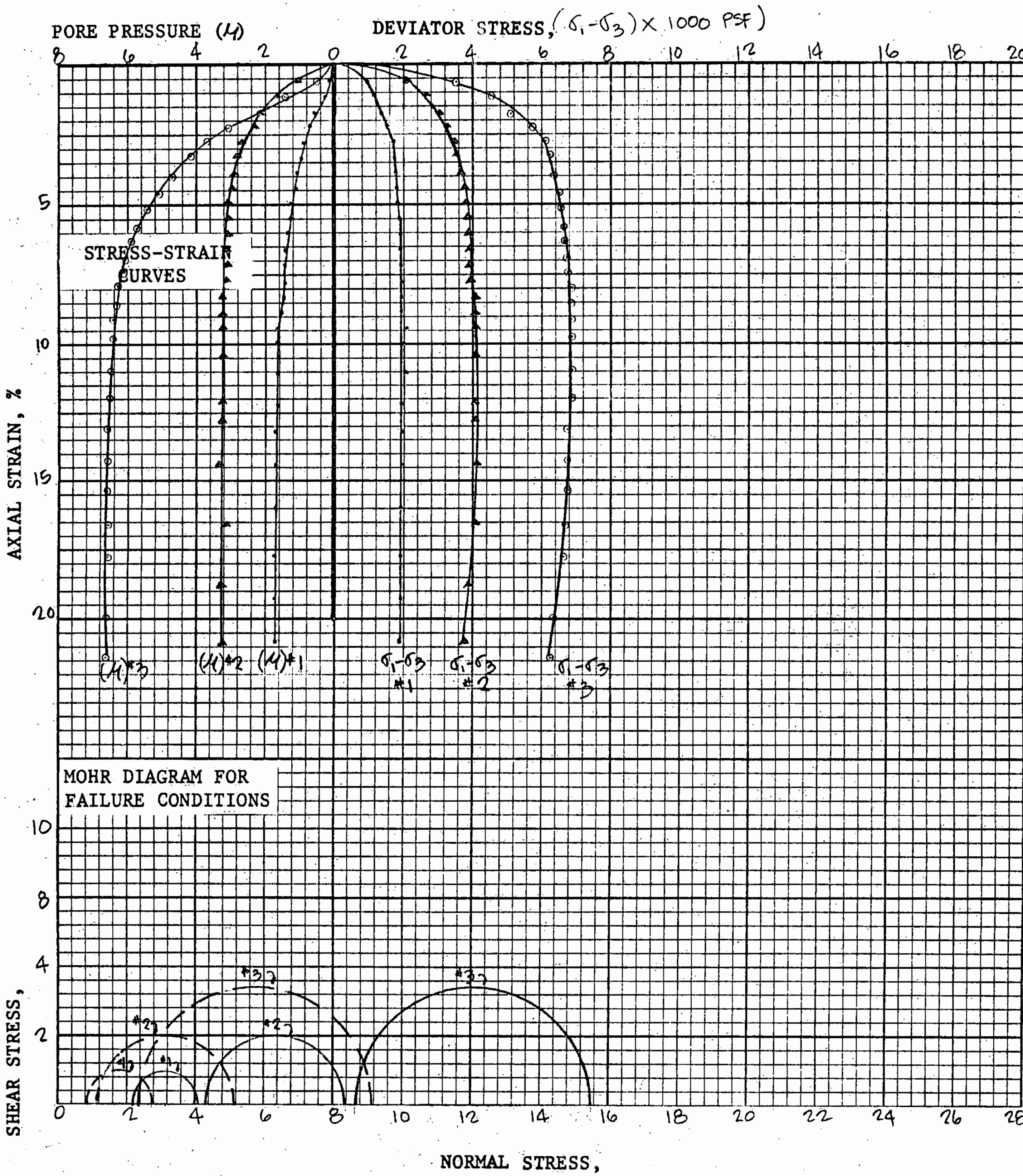
SHAFTER FLATS REFUSE PROCESSING & TRANSFER STATION

KEY	BORING NO.	SAMPLE NO.	DEPTH	TEST TYPE	LATERAL PRESSURE P.S.F.	DEVIATOR STRESS P.S.F.	WATER CONTENT, % INITIAL	WATER CONTENT, % FINAL	DEGREE OF SATURATION, % INITIAL	DEGREE OF SATURATION, % FINAL	AXIAL STRAIN %
1	11	6	30' TO 31.5'	Q	2160	1120	74				6.4

TEST TYPE

'Q"-UNCONSOLIDATED, UNDRAINED

WALTER LUM ASSOCIATES, INC.



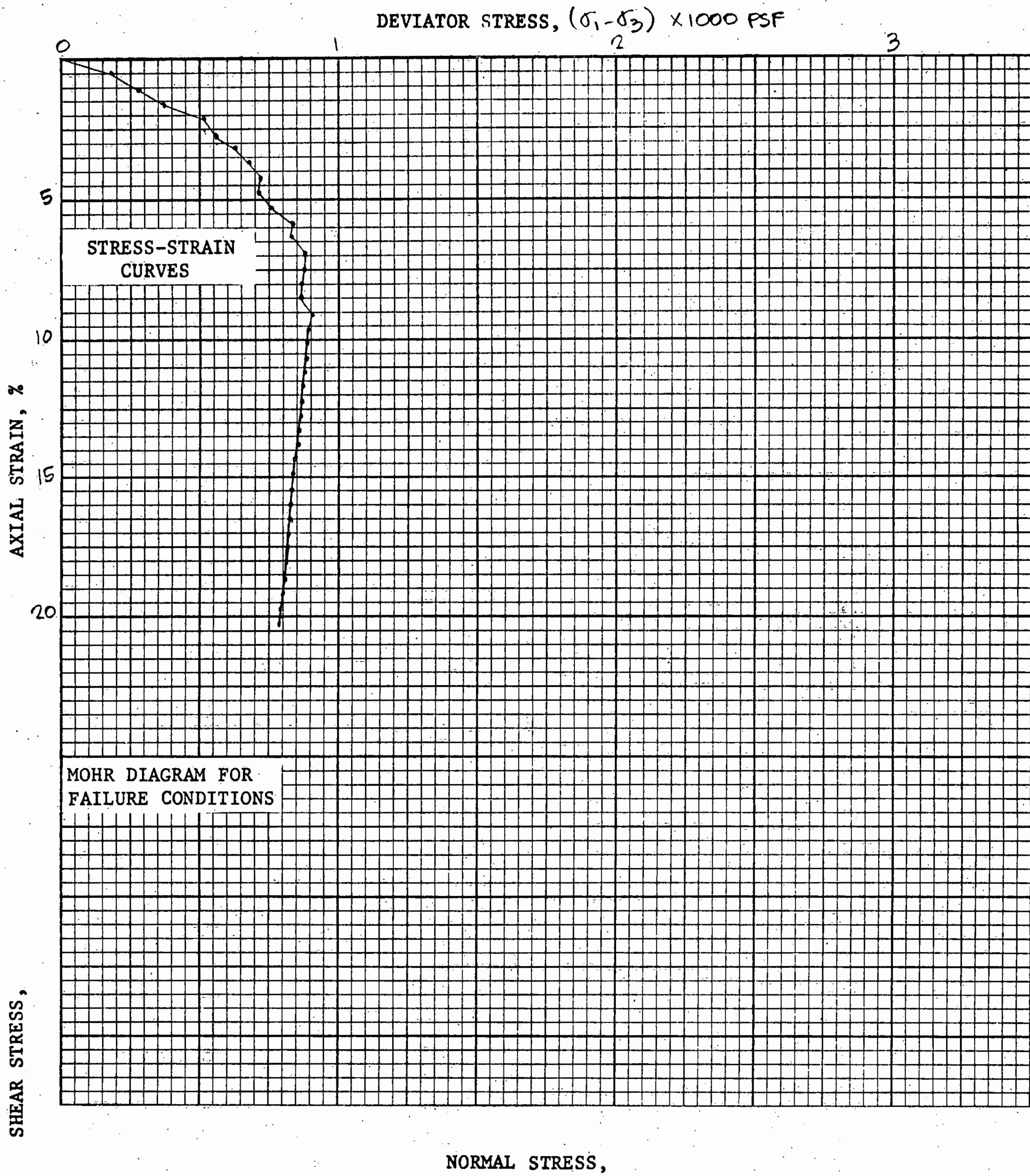
SAMPLE DESCRIPTION	SAMPLE SIZE	ATTERBERG LIMITS	REMARKS	
DARK GRAY CLAY (PARTLY ORGANIC)	2⅞" DIA x 6" H	LL= 79 PL= 35 PI= 44	1 - top 2 - middle 3 - bottom	SHAFTER FLATS REFUSE PROCESSING & TRANSFER STATION

KEY	BORING NO.	SAMPLE NO.	DEPTH	TEST TYPE	LATERAL PRESSURE P.S.F.	DEVIATOR STRESS P.S.F.	WATER CONTENT, % INITIAL	WATER CONTENT, % FINAL	DEGREE OF SATURATION, % INITIAL	DEGREE OF SATURATION, % FINAL	AXIAL STRAIN %
1	13	F	30'	R̄	2160	1940	68	56	-	-	7.2
2	13	F	To	R̄	4320	4050	67	50	-	-	8.3
3	13	F	32	R̄	8640	6850	69	46	-	-	8.0

TEST TYPE

"R̄"- CONSOLIDATED, UNDRAINED

WALTER LUM ASSOCIATES, INC.



SAMPLE DESCRIPTION	SAMPLE SIZE	ATTERBERG LIMITS	REMARKS
GRAY CLAY (PARTLY ORGANIC)	2 7/8" DIA x 6" H	LL= PL= PI=	

KEY	BORING NO.	SAMPLE NO.	DEPTH	TEST TYPE	LATERAL PRESSURE P.S.F.	DEVIATOR STRESS P.S.F.	WATER CONTENT, % INITIAL	WATER CONTENT, % FINAL	DEGREE OF SATURATION, % INITIAL	DEGREE OF SATURATION, % FINAL	AXIAL STRAIN %
1	13	J	70' To 71.5'	Q	4320	720	69	-	-	-	4.3

SHAFTER FLATS REFUSE PROCESSING & TRANSFER STATION

TEST TYPE

"Q"-UNCONSOLIDATED, UNDRAINED

WALTER LUM ASSOCIATES, INC.

LOGS OF BORINGS

FROM

SHAFTER FLATS REFUSE PROCESSING & TRANSFER STATION

(DATED MAY 20, 1975)

SAMPLER: 3" S - 3" O.D. THIN WALL TUBE

Date 4-21-75 | 4-22-75

Unified Soil Classification	DESCRIPTION ELEV. = 13'± *	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 3" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5
(MH)	STIFF, BROWN SILTY CLAY W/SAND, GRAVEL & CORAL (FILL) EL. 10'±		2"SS	1-A	-	19	-	-	-		
(SM)	MEDIUM DENSITY TAN BROWN SILTY SAND W/CORAL	5	2"SS	1-B	-	10	-	-	-		
SC	MEDIUM DENSITY, TAN CLAYEY SAND W/CORAL	10	2"SS	1-C	-	24	-	-	-		
		WATER 4-22-75									
CL	MEDIUM TO SOFT LIGHT TAN SANDY CLAY W/CORAL	15	2"SS	1-D	-	33	-	-	-		
		20	2"SS	1-E	17	37	40	-	-		
(GC)	LOOSE, TAN BROWN CLAYEY CORAL W/SAND	25	2"SS	1-F	-	24	-	-	-		
MH	MEDIUM, BROWN SILTY CLAY W/SAND & TRACES OF GRAVEL	30	2"SS	1-G	35	49	61	-	-		
(MH)	MEDIUM, MOTTLED BROWN CLAYEY SILT W/SOME SAND & GRAVEL	35	3"S	1-H	-	55	- γ_w = γ_D =	- 116 75	650 700		7/0.5' 10/0.5'
SM	MEDIUM DENSITY MOTTLED BROWN SILTY SAND W/TRACES OF GRAVEL	40	2"SS	1-I	-	42	-	-	-		
		45	2"SS	1-J	-	62	-	-	-		
		50	2"SS	1-K	-	39	-	-	-		
(GM)	MEDIUM DENSITY TO DENSE MOTTLED GRAY-BROWN SILTY GRAVEL W/SAND (DECOMPOSED ROCK)	55	2"SS	1-L	-	51	-	-	-	42	
(SM)	MEDIUM DENSITY LIGHT BROWN SILTY SAND W/ TRACES OF CLAY SEAMS	60	2"SS	1-M	-	56	-	-	-		
(MH)	STIFF LIGHT BROWN & GRAY SILTY CLAY W/ BROWN DECOMPOSED ROCK	65	2"SS	1-N	-	47	-	-	-		
MH	STIFF LIGHT BROWN & GRAY CLAYEY SILT	70	2"SS	1-O	41	56	70	-	-		
(MH)	STIFF, BROWN CLAYEY SILT	75	2"SS	1-P	-	47	-	-	-		
	END OF BORING @ 76.5' 4-22-75										

NOTE:
γ_w = WET DENSITY, P.C.F.
γ_D = DRY DENSITY, P.C.F.

* ELEVATION ESTIMATED FROM TOPO MAP BY R.M. TOWILL CORP. DATED 3-31-75

Class	Description	Depth	Sampler	Sample		Moisture				Remarks
			3"S	2-H	-	67	- γw= γD=	- 126 75	103 128	HYDRAULIC PRESSURE 100 PSI /1.5'
		40	3"S	2-I	-	36	- γw= γD=	- 125 92	-	HYDRAULIC PRESSURE 150 PSI /1.5'
SC	LOOSE, GRAY CLAYEY SAND W/SHELLS	45								
			2"SS	2-J	-	35	-	-	-	
(SP-SM)	LOOSE, GRAY SAND W/SHELLS	50	2"SS	2-K	-	28	-	-	-	3/0.5' 1/0.5'
		55	2"SS	2-L	-	38	-	-	-	2 BLOWS/FT
(SC)	LOOSE, GRAY CLAYEY SAND W/SHELLS & SOME FINGER CORAL	60	2"SS	2-M	-	36	-	-	-	3 BLOWS/FT
		65	2"SS	2-N	-	36	-	-	-	
(SC)	LOOSE, BROWN CLAYEY SAND W/SHELLS	70	2"SS	2-O	-	27	-	-	-	
		75	2"SS	2-P	-	34	-	-	-	
(SP-SC)	LOOSE, GRAYISH BROWN CLAYEY SAND W/SHELLS	80	2"SS	2-Q	-	38	-	-	-	
		85	2"SS	2-R	-	43	-	-	-	
(CL)	MEDIUM TO STIFF TAN & GRAY, CLAY W/TRACES OF SAND & DECOMPOSED ROCK	90	2"SS	2-S	-	37	-	-	-	
(MH)	STIFF, MOTTLED BROWN SANDY SILT W/ DECOMPOSED ROCK & SHELLS	95								
(CL)	STIFF MOTTLED TAN BROWN CLAY		2"SS	2-T	-	51 40	-	-	-	
		100	2"SS	2-U	35	45	79	-	-	
CH	STIFF, BROWN CLAY	105	2"SS	2-V	-	53	-	-	-	
(CH)	STIFF, BROWN CLAY W/ TRACES OF SHELLS	110	2"SS	2-W	-	53	-	-	-	
(MH)	STIFF, MOTTLED BROWN SILTY CLAY	115	2"SS	2-X	-	57	-	-	-	

END OF BORING @ 116.5'
4-28-75

* ELEVATION ESTIMATED FROM TOPO MAP BY R.M. TOWILL CORP. DATED 3-31-75

NOTE:
γw= WET DENSITY, P.C.F.
γD= DRY DENSITY, P.C.F.

Class	Description	Depth (ft)	Sample	Sample No.		Moisture	Density			Remarks
			2"SS	3-C	-	20	-	-	-	
(SM)	MEDIUM DENSITY LIGHT BROWN SILTY SAND W/GRAVEL & DECOMPOSED ROCK (FILL)	15	2"SS	3-D	-	21	-	-	-	
	EL. 10'±	20	2"SS	3-E	-	21	-	-	-	
		25	2"SS	3-F	-	26	-	-	-	47/0.5'
(MH)	STIFF, BROWN & GRAY SILTY CLAY W/ SOME DECOMPOSED ROCK & CORAL (FILL)	30	2"SS WATER 4-3-75	3-G	-	35	-	-	-	
(MH)	MEDIUM, BROWN SILTY CLAY W/SAND & GRAVEL	35								
(SM)	LOOSE, GRAY SILTY SAND		3"S	3-H	-	29 34	- $\gamma_W = 114$	-	-	1/0.5' 4/0.5' 7/0.5'
(GC)	MEDIUM DENSITY DARK GRAY CLAYEY GRAVEL W/SOME CORAL	40	2"SS	3-I	-	43	-	-	-	
GC	MEDIUM DENSITY, GRAY CLAYEY CORAL W/SAND, SHELLS & GRAVEL	45	2"SS	3-J	-	45	-	-	-	4/0.5' 1/0.5'
		50	3"S	3-K	-	43	- $\gamma_W = 94$ $\gamma_D = 66$	-	-	HYDRAULIC PRESSURE, 125 PSI /1.5'
		55	2"SS	3-L	-	31	-	-	-	
SM	DENSE, TAN BROWN SILTY SAND W/CORAL	60	2"SS	3-M	-	19	-	-	-	
		65	2"SS	3-N	-	16	-	-	-	44
		70	2"SS	3-O	-	15	-	-	-	50/0.4'
		75	2"SS	3-P	-	14	-	-	-	30/0.1' HAMMER BOUNCES
GC	DENSE, TAN CLAYEY CORAL W/SAND	80	2"SS	3-Q	-	27	-	-	-	
		85	2"SS	3-R	-	12	-	-	-	51
		90	2"SS	3-S	-	15	-	-	-	

END OF BORING @ 91.5'
4-9-75

NOTE: γ_W = WET DENSITY, P.C.F.
γ_D = DRY DENSITY, P.C.F.

* ELEVATION ESTIMATED FROM TOPO MAP BY R.M. TOWILL CORP. DATED 3-31-75

SOLID WASTE STA

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: SHAFTER FLATS REFUSE PROCESSING & TRANSFER STATION

LOCATION: Honolulu, Oahu, Hawaii
Tax Map Key: 1-1-6: Por. 3

HAMMER:
Weight: 140#
Drop: 30"

SAMPLER: 2"SS - 2" STANDARD SPLIT SPOON; 3"S - 3" O.D. THIN WALL TUBE

BORING NO. 4 Sheet No. ____ of ____
Driller: W. LUM ASSOC., INC. Date: APR. 15-21, 1975
Field Party: SHIGENAGA, KAU
Type of Boring: AUGER (MOBILE B-40) Diam. 4"
Elev. 10'± * Datum ____
Drill Bit: FINGER TYPE & ROLLER ROCK

Water Level	9.6'	7.6'	3.8'		
Time	2:30 PM	8:30 AM	8:45 AM		
Date	4-15-75	4-17-75	4-24-75		

Unified Soil Classification	DESCRIPTION ELEV.: 10'± *	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	3" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5'
(MH)	STIFF, MOTTLED BROWN SILTY CLAY W/SAND & CORAL	0	2"SS	4-A	–	28	–	–	–		
(MH)	MEDIUM GRAY SILTY CLAY W/TRACES OF SHELLS	5	2"SS	4-B	–	31	–	–	–		
	COBBLES		WATER 4-24-75								
		10	2"SS	4-C	NO RECOVERY					3 BLOWS PER FT	
ML	SOFT, GRAY SANDY SILT W/CORAL										
		15	3"S	4-D	–	31	– $\gamma_W=$ $\gamma_D=$	– 119 91	–		2 MAN PUSH/0.5' HYDRAULIC PRESSURE 300 PSI /0.5'
(CH)	SOFT, GRAY CLAY W/TRACES OF SAND & SHELLS (PARTLY ORGANIC)	20	3"S	4-E	–	62	–	–	340 300		2 MAN PUSH/0.8'
(OH)	SOFT, DARK GRAY ORGANIC CLAY	25	3"S	4-F	–	86 79	– $\gamma_W=$	– 100	–		HYDRAULIC PRESSURE 250 PSI / 1.5'
		30	3"S	4-G	34	68	76 $\gamma_W=$ $\gamma_D=$	– 103 62	500 540 520 540		HYDRAULIC PRESSURE 50 PSI / 1.5'
		35	3"S	4-H	–	68	– $\gamma_W=$ $\gamma_D=$	– 101 60	300 300		2MAN PUSH/1.0' ~~HYDRAULIC~~ PRESSURE 100 PSI /0.5'
		40	3"S	4-I	36	74	81 $\gamma_W=$ $\gamma_D=$	– 100 57	420 420 440		1 MAN PUSH/1.0' HYDRAULIC PUSH /0.5'
		45	3"S	4-J	–	75	– $\gamma_W=$ $\gamma_D=$	– 91 52	112 104		2 MAN PUSH/0.5' HYDRAULIC PRESSURE 200 PSI / 1.0'
		50	3"S	4-K	–	76	– $\gamma_W=$ $\gamma_D=$	– 97 55	110		HYDRAULIC PRESSURE 200 PSI / 1.5'
CH	SOFT, GRAY CLAY	55	3"S	4-L	–	75	– $\gamma_W=$ $\gamma_D=$	– 105 60	160 156		HYDRAULIC PRESSURE 100 PSI / 1.5'
		60	3"S	4-M	–	70	– $\gamma_W=$ $\gamma_D=$	– 113 67	200 188		2 MAN PUSH/1.0' HYDRAULIC PRESSURE 50 PSI / 0.5'
		65	2"SS	4-N	-	68	–	–	–	3 BLOWS/FT	
		70	3"S	4-O	–	76	– $\gamma_W=$	– [illegible]	212 232		WT. OF RODS/1.0' HYDRAULIC [illegible]

								γ_D=	56			150 PSI /0.5'
		75	2"S	4-P	–	65	– γ_W= γ_D=	490 100 61	160 156		WT. OF RODS/2.0
		80	2"SS	4-Q	33	68	74	–	–	1 BLOW/FT	
		85	3"S	4-R	–	80	– γ_W= γ_D=	– 106 59	–		HYDRAULIC PRESSURE 200 PSI /1.5'
		90	2"SS	4-S	–	59	–	–	–		
MH	SOFT GRAY SILTY CLAY	95	3"S	4-T	36	71	75 γ_W= γ_D=	– 97 57	152		HYDRAULIC PRESSURE 200 PSI /1.5'
(CH)	MEDIUM, GRAY CLAY W/TRACES OF SHELLS	100	2"SS	4-U	–	63	–	–	–		
(CH)	SOFT, DARK GRAY CLAY W/SHELLS	105	3"S	4-V	–	68	– γ_W= γ_D=	– 99 59	800 800		HYDRAULIC PRESSURE 0 200 PSI /1.5'
(CH)	MEDIUM TO STIFF GRAY, CLAY W/SHELLS	110	2"SS	4-W	–	44	–	–	–		
(CH)	MEDIUM, GRAY-BROWN CLAY W/CORAL	115	2"SS	4-X	–	38	–	–	–		
(CH)	MEDIUM, BROWN CLAY W/ SAND, SHELLS & CORAL	120	3"S	4-Y	–	56	–	–	–		HYDRAULIC PRESSURE 400 PSI /1.5'
		125	2"SS	4-Z	–	35	–	–	–		
(CH)	SOFT, GRAY, CLAY										
(CL)	MEDIUM, BROWN SANDY CLAY W/CORAL	130	3"S	4-AA	–	96 63 42 19	–	–	–		HYDRAULIC PRESSURE 600 PSI /1.5'
(SC)	LOOSE, TAN CLAYEY SAND W/CORAL										
(GC)	LOOSE, TAN CLAYEY CORAL W/SAND										
CL	MEDIUM MOTTLED GRAY CLAY W/SAND, CORAL & DECOMPOSED ROCK	135	2"SS	4-BB	24	38	49	–	–		
(CL-CH)	MEDIUM, TAN-GRAY CLAY W/ DECOMPOSED ROCK	140	3"S	4-CC	–	41	– γ_W= γ_D=	– 122 87	–		HYDRAULIC PRESSURE 600 PSI /1.5'
(CL)	MEDIUM TAN & GRAY SANDY CLAY W/SHELLS & DECOMPOSED ROCK	145	2"SS	4-DD	–	29	–	–	–		
(CH)	SOFT, GRAY CLAY										
(SC)	LOOSE, GRAY CLAYEY SAND	150	3"S	4-EE	–	66 56 34	– γ_W=	– 110	88 80		HYDRAULIC PRESSURE 300 PSI/1.5'
	MEDIUM DENSITY TO DENSE TAN, CLAYEY SAND W/SHELLS & DECOMPOSED ROCK										
		155	2"SS	4-FF	–	39	–	–	–	42	
(CL)	STIFF, MOTTLED TAN CLAY W/SAND, CORAL & DECOMPOSED ROCK										
		160	2"SS	4-GG	–	22	–	–	–	66	

(GL)	MEDIUM TAN & GRAY SANDY CLAY W/SHELLS & DECOMPOSED ROCK	145	2"SS	4-DD	-	29	-	-	-		
(GH)	SOFT, GRAY CLAY	150									
(SC)	LOOSE, GRAY CLAYEY SAND		3"S	4-EE	-	66 56 34	- γw=	- 110	88 80		HYDRAULIC PRESSURE 300 PSI/1.5'
	MEDIUM DENSITY TO DENSE TAN CLAYEY SAND W/SHELLS & DECOMPOSED ROCK	155	2"SS	4-FF	-	39	-	-	-	42	
(CL)	STIFF, MOTTLED TAN CLAY W/SAND, CORAL & DECOMPOSED ROCK	160	2"SS	4-GG	-	22	-	-	-	66	
(GH)	STIFF, MOTTLED BROWN CLAY W/ SAND, SHELLS & CORAL	165	2"SS	4-HH	-	56	-	-	-	43	
(MH-CH)	STIFF MOTTLED BROWN SILTY CLAY W/ TRACES OF SAND & GRAVEL	170	2"SS	4-II	-	48	-	-	-	56	

END OF BORING @ 171.5'
4-24-75

*ELEVATION ESTIMATED FROM TOPO MAP BY R.M. TOWILL CORP. DATED 3-31-75

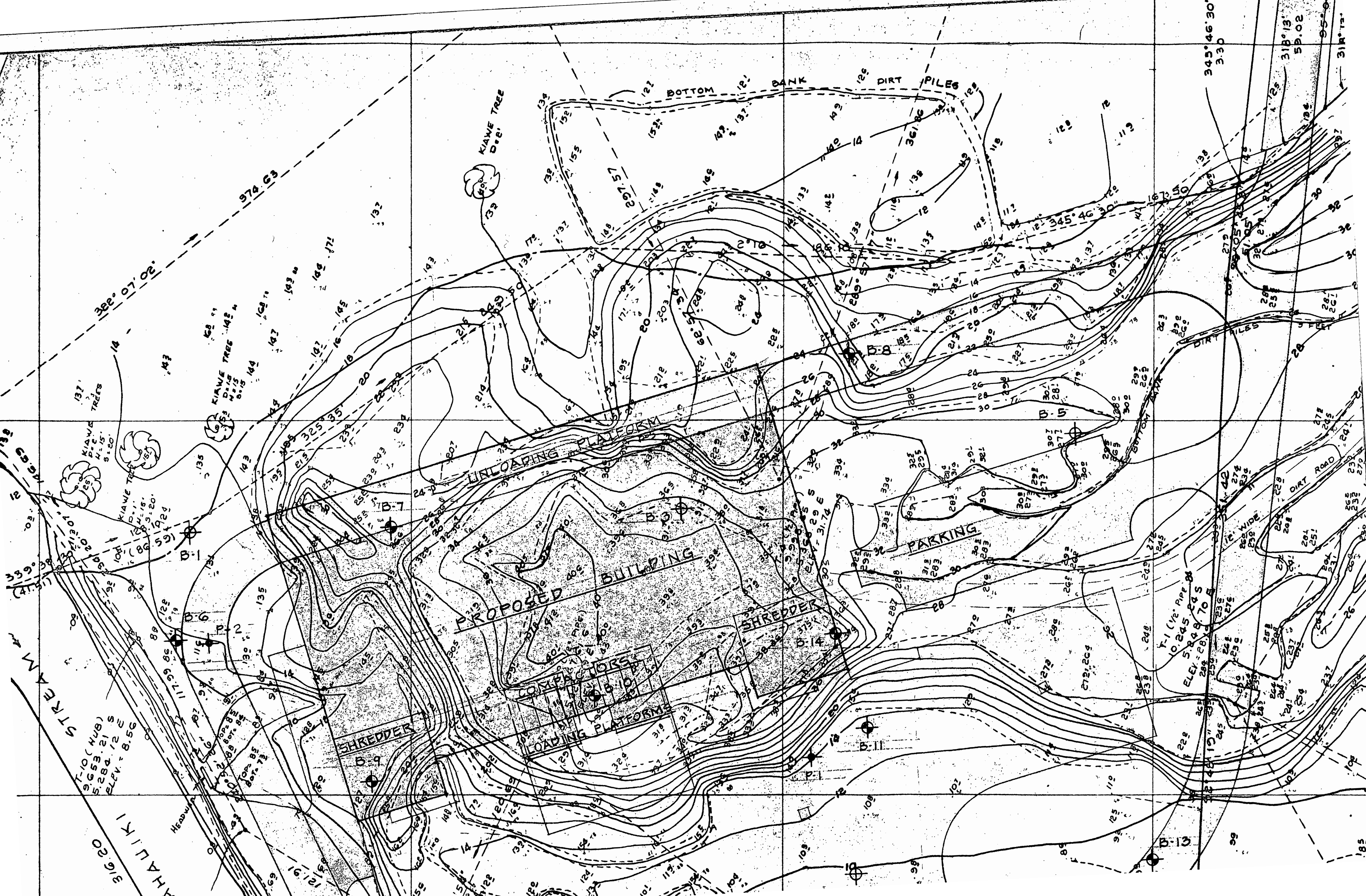
NOTE:
γW = WET DENSITY, P.C.F.
γD = DRY DENSITY, P.C.F.

EL. 10'± *

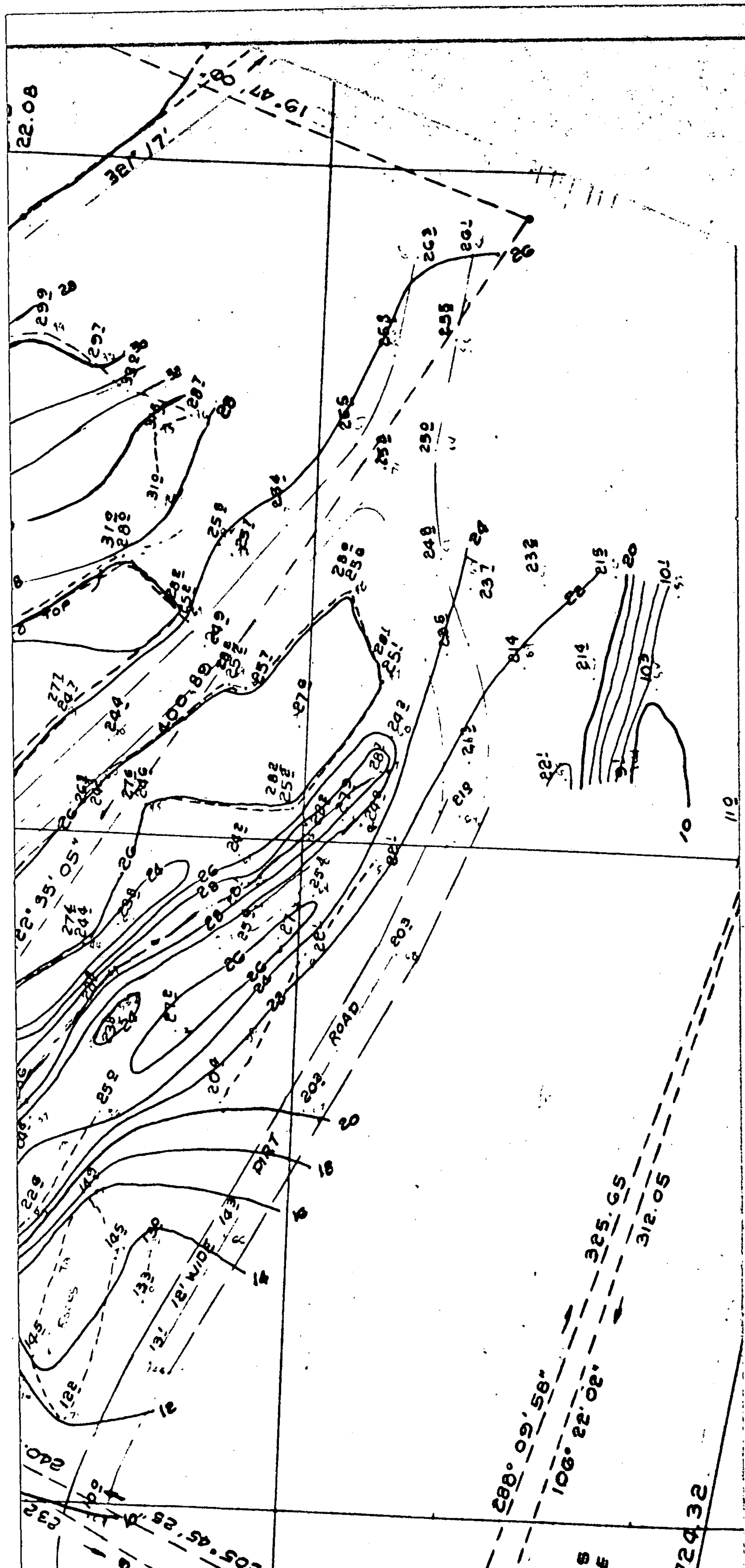
			2"SS	5-D	-	21	-	-	-	
SM)	MEDIUM DENSITY TO LOOSE MOTTLED BROWN SILTY SAND W/GRAVEL (FILL?)	20	2"SS	5-E	-	21	-	-	-	
(MH)	STIFF, BROWN SILTY CLAY W/SAND & CORAL	25	2"SS WATER 4-14-75	5-F	-	22	-	-	-	
CL	SOFT, GRAY CLAY W/SAND	30	2"SS	5-G	23	41 23	45	-	-	WT OF HAMMER/1.0'
SP-SM	MEDIUM DENSITY WHITE, SILTY SAND & CORAL NOTE: HOLE CAVED IN AT 2.0'.	35	3"S	5-H	-	20	- γ_W=	- 114	-	5/0.5
							γ_D=	95		
(SC)	LOOSE, GRAY CLAYEY SAND W/SHELLS & SOME CORAL	40	2"SS	5-I	-	50	-	-	-	
GC	LOOSE, LIGHT GRAY CLAYEY CORAL W/SAND & SHELLS	45	2"SS	5-J	-	51	-	-	-	
		50	2"SS	5-K	-	43	-	-	-	
GC	MEDIUM DENSITY LIGHT GRAY CLAYEY CORAL W/SHELLS & SAND	55	2"SS	5-L	-	57	-	-	-	
(GC)	LOOSE, GRAY CLAYEY CORAL W/SAND & SHELLS	60	2"SS	5-M	-	52	-	-	-	
		65	2"SS	5-N	-	39	-	-	-	
(SM)	MEDIUM DENSITY, GRAY SILTY SAND W/CORAL & SHELLS (ORGANIC)	70	2"SS	5-O	-	44	-	-	-	
(GC)	MEDIUM DENSITY, GRAY CLAYEY SAND & CORAL W/SHELLS	75	2"SS	5-P	-	29	-	-	-	
(GC)	MEDIUM DENSITY TAN CLAYEY SAND & CORAL	80								
(MH)	STIFF, MOTTLED BROWN CLAYEY SILT W/SAND & DECOMPOSED ROCK		2"SS	5-Q	-	23 30	-	-	-	
(SM)	MEDIUM DENSITY, BROWN SILTY SAND W/SOME GRAVEL (RIVER GRAVEL)	85	2"SS	5-R	-	52	-	-	-	
(MH)	STIFF, MOTTLED BROWN SILTY CLAY W/TRACES OF DECOMPOSED ROCK	90	2"SS	5-S	-	60	-	-	-	
(MH)	STIFF, BROWN SILTY CLAY W/GRAVEL	95	2"SS	5-T	-	42	-	-	-	
	END OF BORING @ 96.5' 4-14-75									

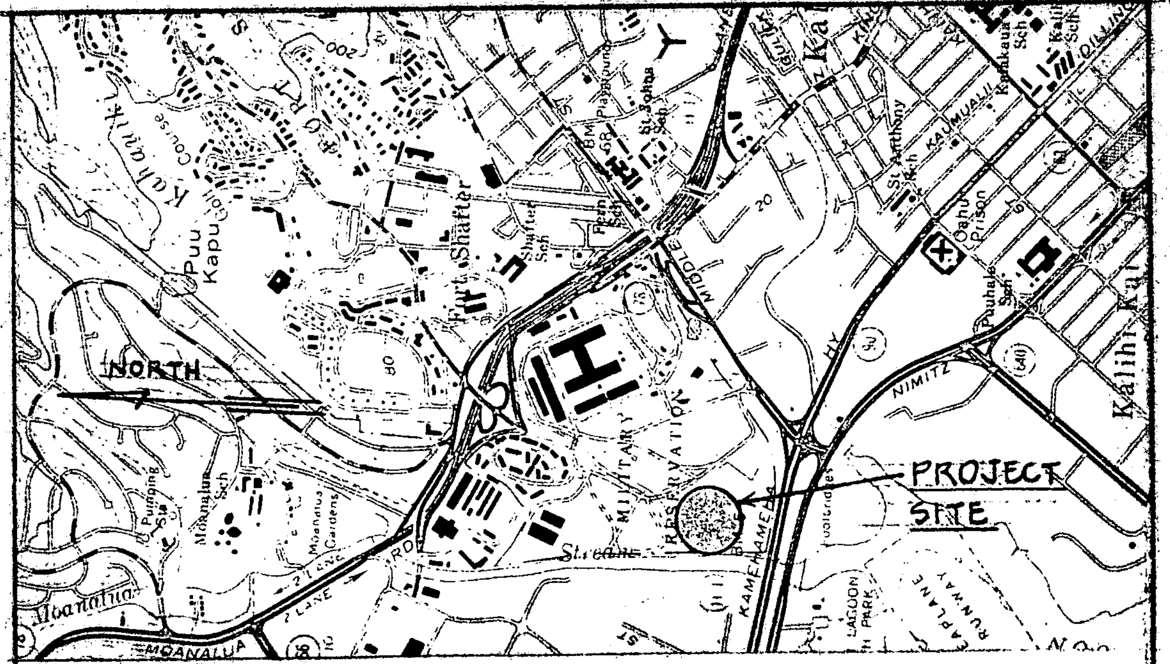
NOTE:
γ_W= WET DENSITY, P.C.F.
γ_D= DRY DENSITY, P.C.F.

* ELEVATION ESTIMATED FROM TOPO MAP BY R.M. TOWILL CORP. DATED 3-31-75



BOTTOM BANK DIRT PILES
KIAWE TREE
UNLOADING PLATFORM
PROPOSED BUILDING
PARKING
SHREDDER
COMPACTORS
LOADING PLATFORM
SHREDDER
DIRT PILES
BOTTOM BANK
DIRT ROAD
12' WIDE
STREAM
B-1
B-5
B-6
B-7
B-8
B-9
B-10
B-11
B-13
B-14
P-1
P-2
974.63
322° 07' 02"
345° 46' 30"
167.50





PROJECT LOCATION SKETCH

NOT TO SCALE

NORTH

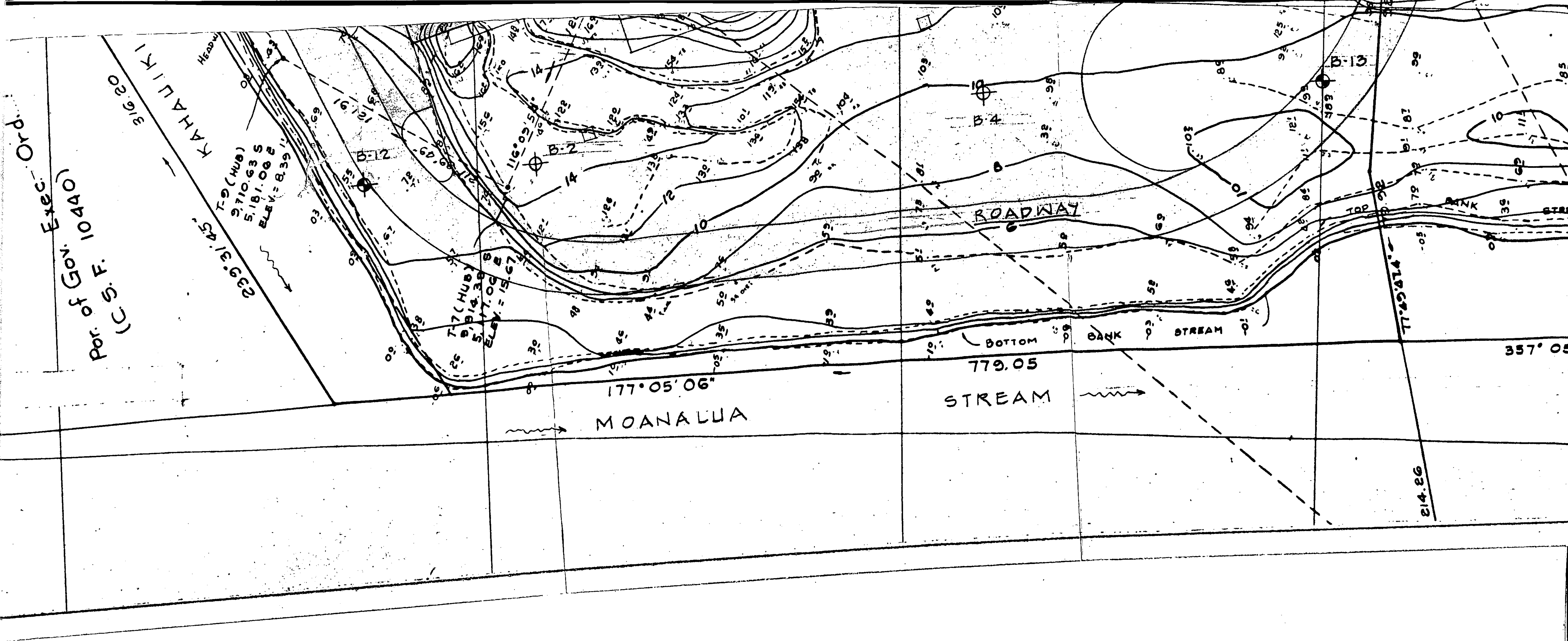
SCALE: 1" = 40'

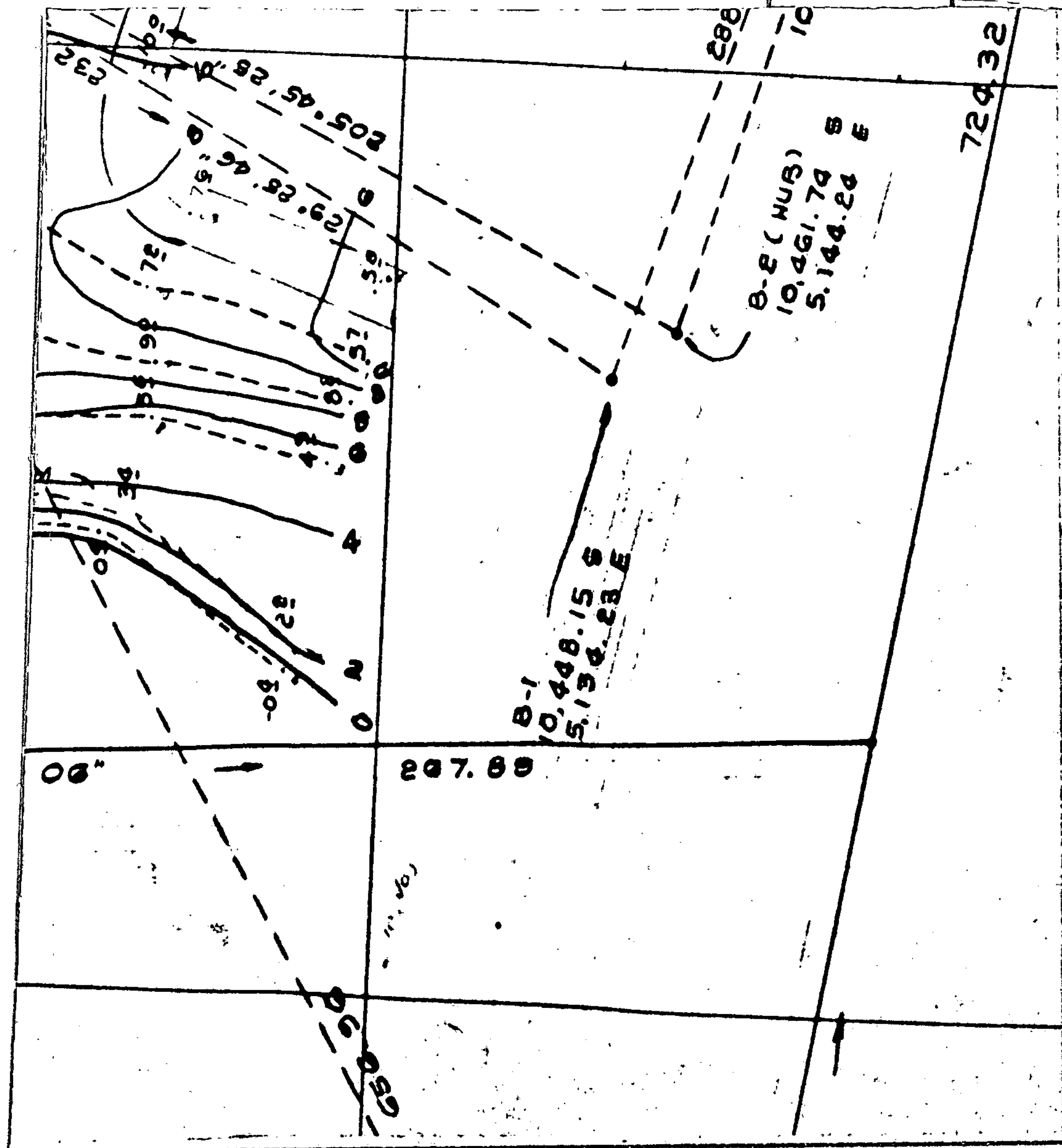
LEGEND

BORING FOR THIS REPORT

BORING FOR RECONNAISSANCE REPORT DATED MAY 20, 1975.

PROBING FOR RECONNAISSANCE REPORT DATED MAY 20, 1975.


Por. of Gov. Exec. Ord.
(C.S.F. 10440)
316.20
KAHAUIKI
233°31'45"
T-9 (HUB)
9710.63 S
5181.06 E
ELEV. = 8.39
B-12
B-2
B-4
B-13
ROADWAY
T-7 (HUB)
ELEV. = 15.67
BOTTOM BANK STREAM
TOP BANK
177°05'06"
779.05
MOANALUA STREAM
357°05
214.86



BORING LOCATION SKETCH
SHAFTER FLATS REFUSE PROCESSING
AND TRANSFER STATION
HONOLULU, OAHU, HAWAII

Dr. Date 12/15 Rev.	WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVE. CIVIL ENGINEERS PHONE 737-7931	Sheet of

LIMITATIONS

In general, soil formations are commonly erratic and rarely uniform or regular. The boring logs indicate the approximate subsurface soil conditions encountered only at the drill holes where the borings were made at the times designated on the logs and may not represent conditions between borings, at other locations, or at other dates. Soil conditions and water levels may change with the passage of time, construction methods or improvements at the site.

During construction, should subsurface conditions much different from those in the borings be observed, encountered, or otherwise indicated, we should be advised immediately to review or reconsider our recommendations in light of the new developments.

This report was prepared only for the indicated use of the site. If there is a substantial lapse of time between the submission of this report and the start of work at the site, or if conditions have changed due to natural causes, plan changes, or construction operations at or adjacent to the site, it is recommended that this report be reviewed to determine the applicability of the recommendations considering the time lapse, changed conditions, and changes in the state of the art of soil engineering.

Our professional services were performed, findings obtained and recommendations prepared in accordance with generally accepted soil engineering practices. This warranty is in lieu of all other warranties expressed or implied.

Contract documents and specifications often prescribe supervision by the soil engineer. It should be understood by all parties that the soil engineer's actual scope of work is very limited. We as the soil engineer do not assume the day to day physical direction of the works, nor minute examination of the elements, nor do we assume the responsibility for the safety of the contractor's workmen. Supervision, inspection, control, etc., by the soil engineer generally mean taking of soil tests and making visual observations, sometimes on only an intermittent basis relating to earthwork or foundations for the project. The soil engineer does not guarantee the contractors' performance, but rather looks for general conformance to the intent of the plans and soil report. Any discrepancy noted by the soil engineer regarding earthwork or foundations will be referred to the project engineer or architect or contractor for action.

Although the soil report may comment or discuss construction techniques or procedures for the design engineer's guidance, the report should not be interpreted to prescribe or dictate construction procedures or to relieve the contractor in anyway of his responsibility for the construction.